THE FOUNDRY

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An Improved Core Oven and Car.

BY PAUL R. RAMP.

The following is a description of an oven I have just completed, to be used in drying locomotive cylinder molds.

The inside dimensions are 30 ft. long, 12½ ft. wide and 8½ ft. high; wall 17 in. thick.

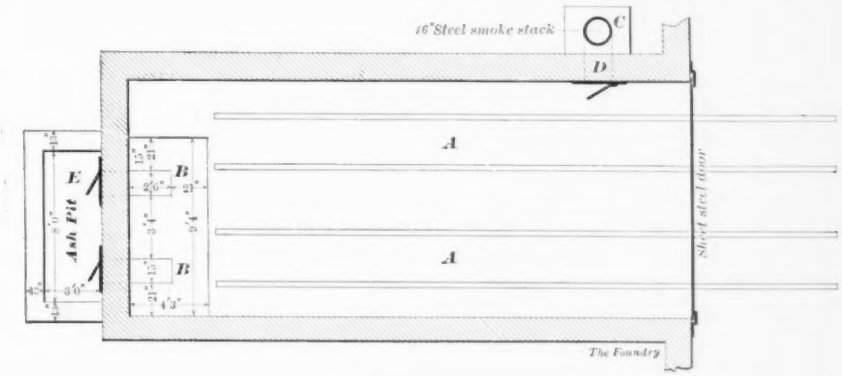


FIG. 1

The letter A in Fig. 1 represents two tracks 30 in. gauge for the use of four cars built to carry the molds from the cranes into the oven. The fire boxes, two in number, are shown at B. They measure inside, 15 in. wide, 30 in. long and 24 in. from grate bars to top of wall. One fire creates all the heat necessary to properly dry a mold, but both are used in case of a rush job.

The letter C is a smoke stack base, built of brick, 36 in by 30 in., with a cast-iron stack plate 1 in. thick covering it that supports a 16 in. by 50 ft. steel stack. The flue leading from the oven to the stack is marked D and is on a level with the floor, located in an opposite corner from the fire boxes, thus utilizing all the heat possible.

Letter E represents a pit, the bottom of which is on a level with the bottom of the two ash pits; being paved with brick it is an easy matter to draw the ashes out from under the fires to load and haul them away.

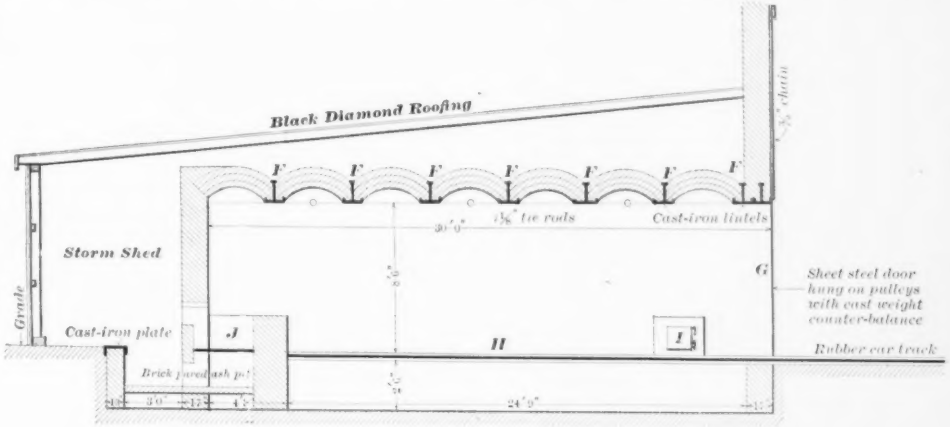


FIG. 2

Fig. 2 is a side view of the oven, 8 cast-iron lintels weighing 1,000 lbs. each used to support the seven arches built of three layers of brick, are indicated by the letter F.

G is a steel door hung on pulleys with a cast-iron counter balance. H gives us another view of the tracks for oven cars, I of the flue leading to the smokestack and J a section of one of the fire boxes, showing grate bars and ash pit below.

this would give us another start, which generally places the car where it is wanted. When the car is in the oven the axles, while acting as rollers, will be moved to the point indicated by the letter B, which gives us the same advantage in pulling the car out of the oven. An important item is the larger the wheel and the smaller the axle, the greater distance the car will travel as on rollers. We have used this style of a car

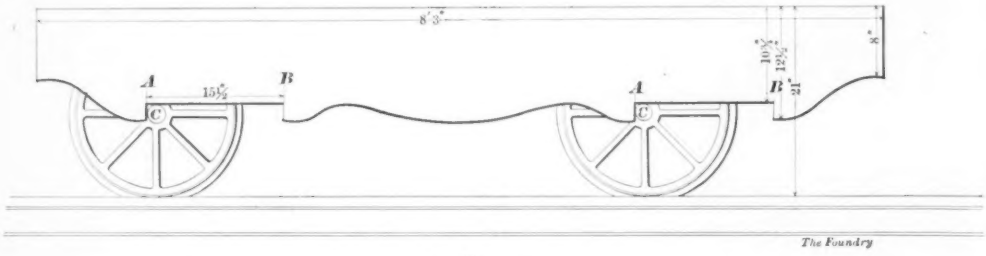


FIG. 3

The roof is carried out past the end of the oven far enough to form a shed for fuel. A wall plate or coping is placed on the top of the brick wall, around the pit, to protect it. This oven opens into the foundry.

My experience with ovens built on this plan has proven to me that they require less fuel for the same work, and less repairing than the average oven built for the same purposes. Fig. 3 is a side elevation of the cars built for this oven.

The frame of the car is 8 ft. 3 in. long and 10¾ in. deep, and about 36 in. wide. The advantage of this car over many others is its simplicity in construction and the ease with which it can be moved.

There are no boxing for the axle, as is generally the case, but instead a recess is cut in the frame of the car, as shown from letter A to B in Fig. 3. This section of the frame rests on the ends of each axle which protrudes through the wheels about four inches; the end of axle is shown at letter C. The principle is as follows: When the car is being pushed into the oven the axle C acts as a roller till it reaches B, making it possible for one man to push a very heavy load, as there is but little friction before the axle reaches B and by that time we have acquired enough headway to get the car where we want it. Should it run too hard we can pull it back a short distance, as the axles would then be in a location as to act as a roller; when pulling the car back

for over ten years and think it is the best for heavy work.

The Casting of a Lathe Bed.

BY R. H. PALMER.

The casting of a lathe bed 27 feet long involves some principles in molding that I have thought might possess sufficient interest to the readers of THE FOUNDRY to warrant their illustration.

In this case the casting was molded in the floor, a cope alone being used. The pattern is made solid and provided with coreprints to receive the cores for the V slides by which these are formed. The inside of the bed is cored out with green sand cores, rammed up on iron plates in a core box, this method giving a better chance to finish the mold. The outside of the track is arranged to be drawn inwards after the main pattern has been removed.

It is one peculiar feature of a lathe bed casting that it generally shows an inclination to bend in an opposite direction from the average castings, in which the ends come up in cooling, while in a lathe bed the central portion of the casting generally comes out high. For this reason the bed of the mold on which the pattern is placed is commonly made five-sixteenths of an inch higher at each end, this amount being sufficient to overcome the tendency of the casting to be high at the center.

When the pattern is placed on the bed together with a weight to hold it in place, sections of the cores to form the V are shoved up against the print of the pattern and enough sand rammed against them to keep them from shifting. The strips forming the outside of the V groove are next

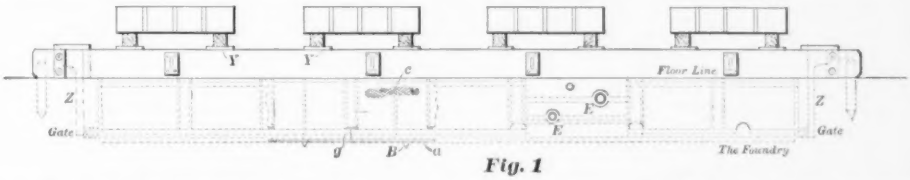


Fig. 1

attached and this part of the pattern partly rammed up.

The gates Z, Fig. 1, may either be made to draw in or core-gates of the right size may be set against the pattern. In many shops it is customary to surround the main gate with rings to prevent it from giving

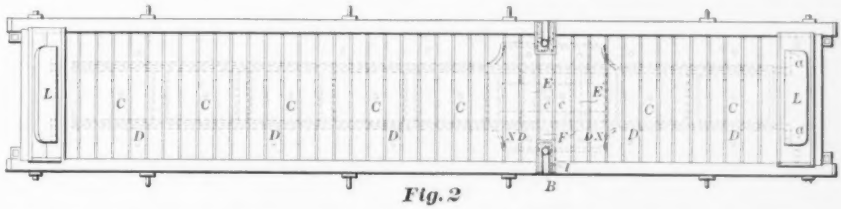


Fig. 2

away when the mold is being poured. Other shops will lay in rods to secure the same end.

Besides the gate-sticks A, Fig. 2, the riser B and vents C and O are also rammed up in the cope, which in itself is well vented over the pattern. A cope of this length is preferably lifted with two cranes, as this will cause less springing. At A, Fig. 3, will be seen the cores forming the V groove, while at B, Fig. 5, is shown the loose parts of the pattern forming the outside of the V.

When the cope is lifted off a channelway is cut to connect with the upright vents O. Within a few inches of the pattern a row of vents are shoved down, and inside of these another. Next the plates A, Fig. 1, which carry the green-sand cores, are placed in the mold and rapped down, the pins B, Fig. 1, serving as a guide so that the core may fit properly. These plates after being tried in the mold are then used in the core-box, the number of cores to be made depending upon the length of the casting.

At a certain height in the core a pocket of cinders is placed to assist in carrying off the vent. Before placing the cinders in the core that part of it which is already rammed up should be well vented; a gate-stick rammed up in the core will serve to connect these with an outlet through the cope. The cores on the sides are set after the center cores are all in place, E, Fig. 1. In making these cores care must be taken that they are all rammed evenly and well vented. After these cores are set the cores coring out the ties, as Fig. 1, D, are set on studs G. These are dry-sand cores.

The cores seen running through the center of green-sand core as at E, Fig. 2, are set in the core before it is lowered into the mold, and the dry-sand cores at Fig. 2, F, cut through the wall of casting at ends of the cores marked E, while cores cutting through the outside of wing at points E, Figs. 1 and 4, are set before the main dry-sand cores

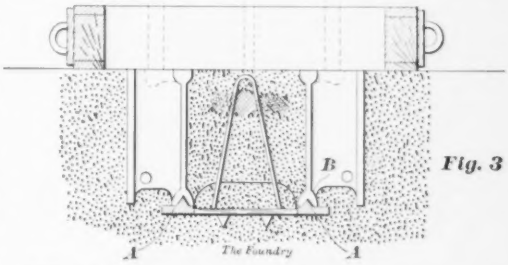


Fig. 3

XX, Fig. 2, are placed. The latter rest on chaplets, but bear against the cope and vents are provided at DX, Fig. 2.

In closing a mold of this character, where the joint is always liable to be more or less scratched up, I prefer to cut a scarf at the edge of the mold before closing and also to scatter a little flour within a couple of

inches of the edge of the cores (there is no need to use a barrel), to insure that the cope not only bears where it should but also as it should. If flour appears to be too expensive use a little parting sand to drop through the gates and vent holes of the cope to assure yourself that all openings are clear and where they are intended to be. Above all means be sure that the cope bears solidly on the cores, as unless such is the case the chances are that the casting will be lost through the iron finding its way over the core. Where chaplets are employed to hold the dry-sand cores in place, the weights can be so distributed on the cope as to render the securing of these a comparatively easy matter.

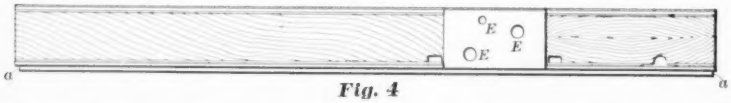


Fig. 4

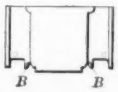


Fig. 5

Where coreprints are employed these should possess an extra amount of draft, as it is very unhandy to remove sand from the mold after the cores are in place. After the casting is poured the cope should be left on until the next day. Removing this too soon is not productive of the best result. When the cope is removed the casting should be taken out and the green-sand cores removed as soon as possible in order that it may cool evenly.

Fig. 1 is a side elevation, Fig. 2 represents a top view, and Fig. 3 an end view of mold. Figs. 4 and 5 show a side and end elevation of the pattern.

Jewett's Cupola.

BY ELI H. PEARCE.

I have read L. C. Jewett's article and examined the cupola design which accompanies same, and also Charles Butterfield's criticism of this and agree with both of these gentlemen on some points.

I do not agree with Jewett when he advises to make the upper tuyeres of the size specified, for I think that they are larger than necessary.

The office of an upper tuyere is only to admit enough air or oxygen to assist combustion, and had he made the combined area of the upper row one-fifth of the combined area of the lower row, he would have struck it about right, according to my opinion.

As he has them arranged, he has six upper tuyeres each 3 inches in diameter, or a combined area of about 42 square inches. The eight lower tuyeres are each 4 inches in diameter, and have a combined area of about 100 square inches, therefore the upper tuyeres contain 42-100 of the area of the lower ones, or a little over two-fifths the area of the lower row.

By having such an opening, he is admitting too much air, with the result of cutting out the lining and creating more slag than necessary.

I will not question his design of turning his tuyeres downward, as I have never had experience with a down-shot tuyere, and I would not like to say much on a subject unless I could back my statement with actual experience. We have too much rot written as facts that is merely based on what the writer thinks would happen if the experiments were tried, and as there are many unposted men who are not competent to judge as to whether an article of this kind is reliable or not, I think the less there is written that is not based on facts, the better it is for the unsophisticated. Returning to the down-shot tuyere, I do not believe that it would cause any damage even if it did no good.

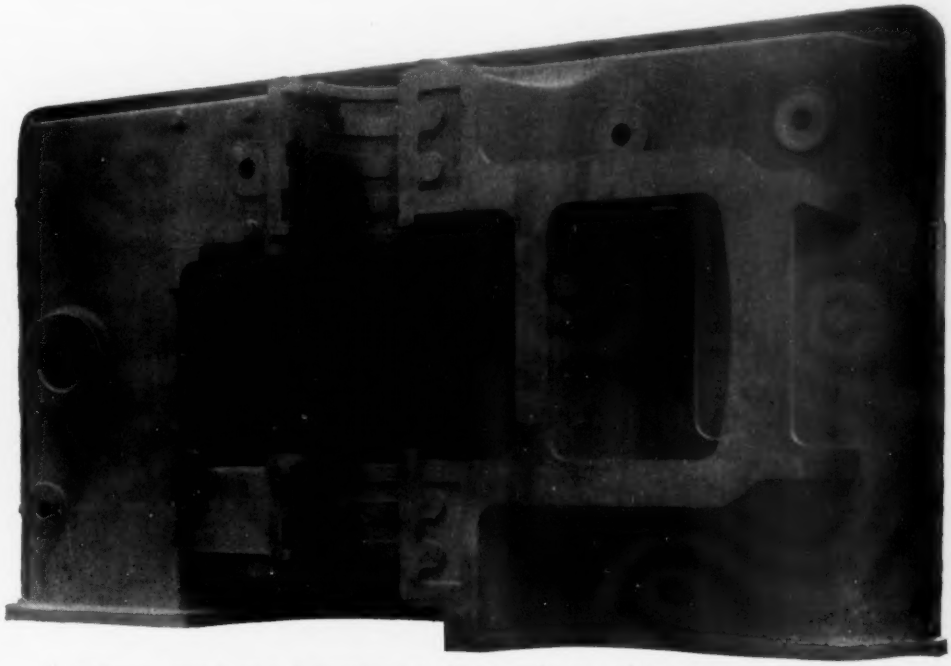
Referring to Mr. Butterfield's chat, I do not agree with him when he says that the melting zone will be from 14 inches to 26 inches above the upper row of tuyeres unless he bases this statement on the size of tuyeres shown in Mr. Jewett's design, for I know that if the tuyeres are only one-fifth the area of the lower row that then the melting zone will remain in about the same place that it would if the upper row of tuyeres were shut off, as the only office that the upper row fills is to supply enough air to aid combustion.

Perhaps Mr. Jewett's down-shot design will act in such a manner as to force the blast down to a lower point of the zone, and for that reason he finds that he can use a larger volume of air to better advantage than he could if it were introduced through a straight tuyere.

At any rate, I believe that the furnace will melt iron and perhaps it might do so rapidly and with little coke, but I am not much given to fancy cupolas, for I contend and it will take a great deal to change my opinion, that the success of a cupola depends more on its management than it does on the design, and that the old-fashioned cupola made of an old boiler shell stood on end is a fairly good cupola yet, and if I was going to put up another one that is the kind it would be.

one word to say. There is no question but that it is technically correct; but whether it is wise and proper, whether it is just to ourselves, we consider an open question.

Starting with pig iron, every foundry has what we call a "Permanency of Stock." This permanency would be arrived at by taking the average amount of pig iron which is inventoried through a series of years. If it is fifty or five thousand tons—or any other figure—this becomes a permanency of stock. In other words, it is a stock which



A CASTING FROM THE FOUNDRY OF SULZER BROS., WINTERTHUR, SWITZERLAND.

What Shall Our Inventory Be?

At a recent meeting of the Pennsylvania Association of stove manufacturers Mr. Abram C. Mott, of the Abram Cox Stove Co. of Philadelphia, made the following remarks on the above named subject:

We are approaching the period when all stove manufacturers will take an inventory and on the result of this inventory much more may depend than appears upon casual observation. We take it that it is usual for manufacturers to inventory stocks of pig iron on hand at market prices and their stocks of goods manufactured, unmanufactured and in process of manufacture, at the present cost of producing them. Regarding the correctness of this method we have not

is never used or, if used, is only used to be replaced with an equivalent stock. It is never sold, but always remains on the foundry bank. If, at the end of this year, you have five hundred tons of pig iron on the bank and that is the normal quantity or permanency of stock, as arrived at above, should you inventory this in the regular manner, viz: at market prices, you would add twelve dollars per ton to your 1899 inventory, which would amount to six thousand dollars. This becomes purely a book profit, a fictitious profit, one which is of no earthly value or of any use to which the money can be put. It is a sale to yourself with the absolute certainty that as the price of pig iron declines in future years, so you

must take from the price of this iron until it eventually will reach 1898 prices. You have simply completed a circle showing a large profit in the first half of the circle and losses in the latter half, which balance the whole, and all are wholly fictitious. This same principle applies to the stock of goods manufactured, unmanufactured and in process of manufacture, which you may have in your works.

There is also a permanency of stock in these articles, which is computed in the same way, by taking the average amount of tonnage of these goods as it appears on the inventories of the past years. This amounts to much more than your pig iron as the average foundry will inventory in this item probably not less than twenty per cent. of their entire sales, and if the price of this permanency of stock is advanced, it also places upon the books very large sums of fictitious profits, every dollar of which will eventually be taken from it by equally fictitious losses. Therein lies a very serious danger to the stove trade of this country for the coming year 1900. To illustrate: a foundry having $250,000 capital with sales of $300,000 a year, in 1898 made a profit of $21,000. This enabled them to pay a six per cent. dividend and carry $6,000 as surplus. This, however, was not satisfactory; they felt they should have made a larger profit and there is no question but what they were correct in this feeling. When they take their inventory at the end of this year in the manner aforesaid they have, say, five hundred tons of pig iron, on which they place a profit of twelve dollars per ton, making $6,000, and they have $50,000 worth of goods manufactured, unmanufactured and in process of manufacture, upon which they figure an advance of forty per cent., making $20,000. They have made during the year on their favorable purchases of iron, etc., say $20,000. It brings the following result: Through their sales to themselves they have made $26,000, through favorable purchases of pig iron, etc., $20,000, and their total profits amount to $60,000. It is very readily seen that the actual profits of their business, instead of being the amount of last year—$21,000—only amount to $14,000, this being the actual amount made in the business, the balance of the $60,000 being made up of favorable purchases of pig iron and increased inventory valuation. You can readily see that this firm made $34,000 this year and in this $34,000 the abnormal condition of the iron market accounts for $20,000. They, however, are too apt to look to the one item, viz: $60,000 profit in 1899, and thereby deceive themselves as to the profits to be derived in 1900.

The actual cost of manufacturing goods at present prices during the year 1900 will not be less than forty per cent. over the prices of 1898 and it is palpable that unless our selling prices are advanced forty per cent. we cannot make the profits that we made in 1898 and whatever decrease there may be in selling prices will simply be a reduction from the profits of 1898. Unless these prices are advanced, we predict that 1900 will be known as the most disastrous year which has ever occurred to the stove industry.

Malleable Furnace Practice and Annealing.

Never has any metal known to the iron casting industry attained the position now occupied in the commercial world by the malleable casting. Perhaps the most gratifying feature connected with its manufacture arises from the fact that wherever it has been introduced it has always developed, to the exclusion of other metals. There was no decline in its quality, which otherwise might have prejudiced the oft-time doubtful purchaser; and this excellence of product is due entirely to the most careful observance of metallurgical operation by those most interested. It is always gaining ground, and when used in castings upon which the service strains are frequent and of varying stress, it has yet to demonstrate a failure. This is best illustrated in the instance of car-building, where the displacement of gray iron has been complete. Today it is entering slowly and gradually (as it always does) upon a new and very extensive field, namely, stove-building. There will be numbers of reasons advanced against its fitness for this class of work, but these objections will be overcome when the application begins in real earnest. We now have malleable "feet," and other parts will soon follow.

As the production of malleable is so at variance with that of gray iron, and there are many misapprehensions, often grave enough to retard possible purchasers from specifying it, perhaps the following brief notes on actual practice may serve to re-

move some of the doubts upon the subject.

Malleable cast iron is a metal from which, during the process of production, certain quantities of carbon have been removed, thus following a metallurgical law, that the lower the percentage of carbon the softer and more ductile will be the metal. Carbon is present in two conditions in pig iron—graphite and combined. As graphitic carbon it is supposed to separate on solidification after a fusion; and as combined it produces a white fracture in metal more or less granular. The former will be the soft irons or grays," and the latter the hard irons or "whites." When a heat is charged into an air furnace the carbon is (generally speaking) in the graphitic condition, and by the oxidizing flame there encountered passes by almost imperceptible gradations into the white or combined condition. There is an intermediate state when the metal is mottled, or having the carbon about half and half, and this is the mottled iron of commerce. There may be combined carbon in gray iron, and, conversely, white iron may contain appreciable quantities of gray or graphitic carbon. The mode of existence of carbon in iron is determined to a great degree by the conditions of solidfication after original casting, and the amount of heat to which it has been subjected. Rapid cooling favors the retention of carbon in the gray iron into white. The amount of total carbon in pig iron, whether it be gray or white, is generally about the same, and its form in one and the other is due directly to a heat condition at the blast furnace. If the iron is very hot, and the percentage of silicon high, the metal will be slow in cooling, and graphitic carbon will be disseminated throughout the mass, giving it the characteristic fractures of a No. 1 and No. 2. If the iron be cold, and the percentage of silicon is low, the carbon by reason of rapid cooling will enter into combination with the iron, and white iron will be the result.

For many years charcoal iron was preferable in malleable casting, as the ores were reduced by charcoal and cold-blast, and really did chill more deeply than other irons; but with the latter-day demand for tonnage, coke iron has been introduced, and in many quarters has entirely superseded charcoal. The form of carbon in pig is, therefore, only an accidental mechanical admixture, while in the malleable casting it is a definite chmical combination with the iron. The theory of malleable cast iron is to produce a material differing from gray iron in that its carbon has been lowered materially, thus allowing it to withstand blows, etc., without breaking. Malleable cast iron is therefore the result of a process of decarbonization by means of a sesqui-oxide. The latter by imparting some of its oxygen to the carbon in the castings, at a red heat, forms CO, and thus extracts the carbon. The theory is that any substance having an affinity for carbon, will extract carbon under a heat condition. This feature is now accomplished by packing the castings in rolling mill scale treated with a mixture of sal-a nmoniac, and under the excessive heat temperatures the CO is formed and given off. Castings are sometimes packed in a hematite ore, and this rich ore is used to decarbonize the castings. From its use arises the term "hematite malleable iron."

Thre are three forms of furnaces used in the production of malleable—the cupola, the reverberatory or air furnace, and the open hearth furnace. Each has separate points of excellence not found in others, and all are producing satisfactory metal for specified purposes. The cupola is not used very extensively in malleable excepting for the manufacture of specialties, owing to the one great difficulty experienced in combining carbon sufficiently to insure the possibility of pouring large castings; also from the fact that there is no method of puddling or mixing metal except in the tapping ladle. If it were always practicable the cupola would be an ideal method for melting, as the economy in fuel consumption is no mean consideration. At present the cupola is used for the pouring of light shapes almost entirely, and in some works the tonnage is very high. One great drawback has been the proclivity of cupola metal to absorb impurities from the fuel, principally sulphur, which metalloid is considered by many authoritative minds to be highly deleterious, although at the present moment there seems a slight weakening in this respect. Sulphur in steel makes that metal "short," ductility being an impossibility when sulphur is present, and in quantity. In malleable metal a condition often arises in which the metal after annealing will have a crystalline grained fracture, sometimes mistaken for under-annealing. There can be no question that a combination of reactions in which sulphur had played a

part, caused this molecular peculiarity, as it is not a natural sequence of the annealing of metal in which the carbon has been, or should have been, in combination at the moment of casting. It might appear from the information available that sulphur in excess has no bad effect upon the casting, but at the same time divergence in practice must be made to comply with prejudices. If consumers would accept metal with a grained fracture the founders would be enabled to make departures in melting. The cupola practically makes no change in the chemical or molecular aspect of the metal; it merely melts. Whatever may be the physical characteristics of the pig iron charged there, will be reproduced in the metal caught at the spout. The molecular change in this metal comes almost entirely with the chilling of metal in the molds at the moment of casting. If the pattern is of sufficient diameter the metal will remain hot for a short moment, and the dampness of the mold being quickly overcome, the result will be that the casting will be gray, and cannot be annealed to advantage. It has always been counted a fact that cupola metal is hotter than air furnace metal, on account of the method of melting; and it is also generally conceded that the cupola metal, being higher or richer in graphitic carbon and silicon, is hotter by virtue of these contained metalloids, while air furnace metal is hot only because of the induced heat of the furnace. This fact of cupola metal being always gray when poured into large castings, precludes the possibility of success in this particular. In only one instance has this class of work been poured successfully, and that is in the instance of the so-called semi-steels, when the combination of carbon has been effected through the liberal use of sulphide of iron. With this latter mixture the cupola performs its work as satisfactorily as the air furnace, and metal is first-class for purposes intended. Using the best grades of charcoal and coke irons together with liberal percentages of sprues or gates, there is no difficulty in producing small castings, and the range of cupola work is covered by the word "small." Carriage and harness trimming, pipe fittings, etc., are the main tonnage at present.

The reverberatory air furnace is the generally accepted type for malleable purposes. There are more of this style in operation than any other, and yet there are some classes of work which can be better produced in another furnace described later. There is nothing in its appearance suggesting complex construction. It is a very simple affair, and yet when its lines have been changed even slightly, the foundryman is thrown out of reckoning at once. The air furnace was the original casting hearth, and has certainly withstood all suggestions of improvements. The reason is that nothing simpler could be designed. For many years the mixture has been made up from the fracture of pig, together with the grading and calculation of silicon by allegation. There was no attention given the other metalloids. The advance of chemistry brought wonderful hopes for dependence upon the worth and reliability of other impurities, but outside of the heat conditions of the first casting at the blast furnace (which are contained in the metalloid silicon) the others have failed to come up to expectations. A heat condition must be realized and recognized before a mixture can be calculated successfully. In the old days when a heat was selected, there was always a large proportion of No. 1 or rich iron chosen. A heat condition was in vogue, though possibly not then recognized as such. In modern practice the effects of all the metalloids are understood, but are not given ranking with silicon. Carbon, as ever, is all-important, but without the presence of silicon its action is void, indeed. No better illustration of the dependence placed upon silicon may be had than if, in making up a heat for air furnace, a No. 5 iron should be substituted for No. 1. The metal when tapped could only be poured into large castings, as its carrying powers would be at once curtailed.

The theory of flame-influence upon the metal in the bath is the same in reverberatory furnaces as in all melting hearths, namely, a reducing and oxidizing force. In earlier days, when the charge was so rich in soft irons, together with small quantities of sprues, there was no possibility of reducing the silicon and effecting the combination of carbon except under continued periods of forcing. The sprues which to-day are accounted the best factor in the mixture were allowed to accumulate, and were eventually sold for scrap. The idea of adjusting the heat through the manipulation of contained metalloids in pig was not in any degree attractive. It was all made upon grade and fracture, consequently when charged it could not be hurried along, but rather was allowed

its own time to develop. The same feature is present to-day, of rushing a heat in which the percentages are not thoroughly calculated, and the combination of carbon is effected by means of forced heat. When this is being done the carbon, on account of this hasty and imperfect treatment, will revert again to the graphitic state, thus rendering the castings worthless. A heat of malleable cannot be forced successfully beyond the capabilities of its chemical constitution, which affects these combinations; but heats may be made up from exactly the same irons and sprues, and some will be ready to tap in four hours, while others will require six and seven hours.

It is this knowledge of metallurgy, chemistry, and manipulation that marks the best melters to-day. The advance in melting has been coincident with the demands of tonnage, which makes it necessary to melt three heats in the time formerly required for one, and using the same grades of iron as before. It is the constant application of the knowledge of effects produced by the various ingredients that has advanced the melting ratio so greatly. In this respect the air furnace easily proves its worth over the cupola. Heats are charged and the burden of responsibility for their development rests with the silicon content. Carbon is no longer given precedence in calculating, as we are recognizing a heat condition accompanying carbon, and the certain percentages of silicon, contained in the pig, work out the physical problems of melting. For light castings the silicon runs from .90 to 1.25, and is the metalloid which promotes the fluidity of the metal, as it is the natural element of contained heat.

That carbon is not, and cannot be the controlling influence for fluidity, is no better proved than when contrast is made between heats for light and heavy work. The carbon content in both varies but slightly, the silicon radically and the fluidity or running qualities of the heats bear no comparison whatever. In air furnace practice for light castings of small diameters and varied shapes, where it is a question of pouring iron sufficiently hot to run patterns, the combination of carbon is effected to a great extent by rapid cooling in contact with damp sand. In respect to heavy castings of deep diameters the carbon must be combined in furnace before tapping, and this is brought about with the smaller amounts of silicon, thus reducing the initial heat of metal. This allows the metal in large castings to set quickly. Were there a high percentage of silicon present in heavy work mixtures, the castings would retain fluidity long enough to allow graphitic carbon to precipitate, and be disseminated throughout the castings, which therefore would be gray and worthless.

The time of heat in the reverberatory furnace depends upon how refractory the charge may be. If the iron charged is rich, the heat will come up much more quickly, and the iron be hotter than if the charge be "lean" or high iron; for after the latter is melted it must be heated still further by the artificial means at hand, as it contains no latent heat energy in itself. The quality of coal used and the pressure of blast have a very important bearing in this style of furnace. A soft blast is much to be preferred, depending in a measure upon the quality of coal used. With high blast pressure there is always a tendency toward dirty metal, and the chance for occluded gases causing blow-holes below surfaces is greater. Again, should the blast be too strong, there will be a large loss in oxidization, for after the metal is skimmed the flame will have every chance for play. The loss in furnace by oxidization is sometimes as high as 12½ per cent of the total charge. The overhead blast, or air introduced over the fire bridge wall, has had a great influence on this latter loss in furnace.

The size of air furnaces are growing larger every year. Some of the later ones melt as high as 16 and 18 tons—this, of course, on heavy work, when the metal is carried away in large ladles. The melting ratio has been very general, and it takes from 40 to 50 per cent coal to melt one ton of iron charged.

The Siemens-Martin acid open-hearth furnaces have been the latest style adopted into the malleable casting industry. Its sphere has been heavy work casting entirely, and we have yet to hear of its continued success on light work. These furnaces melt through the influence of a hydro-oxygen flame. The hydrogen is from the carburetted hydrogen of coal gas, and the oxygen from the atmospheric air. These gases before they are combined are heated by the exhaust heat of the furnace, which in ordinary constructions passes directly to the stack, but in this style

furnace is utilized to heat a chamber composed of brick checker work. The atmospheric air is introduced by means of a valve into the chambers and enters the furnaces very hot. One feature of these furnaces is economy in fuel; another the possibility of melting iron away from the contaminating impurities contained in coal and coke. This furnace is operated at a much higher temperature than air furnaces and much better brick are required in its construction. The temperature of the bath rises after the melting point to 3,500° and 4,000° Fahr. The make-up of a heat does not vary greatly from other practice, excepting that it will carry higher percentages of wrought scrap. This latter, on account of its low carbon, forms an attractive feature in the mixture. The flame being very intense oxidizes the metal raidly, and the combination of carbon is effected, beyond doubt, long before the metal is hot enough to flow. For the manufacture of railway couplers, draft-rigging and all car-body work, this furnace produces a metal which for uniformity stands alone. The metal after annealing is softer and tougher on account of the low carbon content.

This furnace is always under perfect control, as not only may the supply of gas and air be governed in the valve passages, but also, if necessary, the production of gas may be shut off at a moment's notice and restarted in the same length of time. It will thus be seen how substantially this furnace competes with air, or other reverberatory hearths for all the purposes required. The economy in fuel is estimated at fractionally one-half (when making comparisons), even when the same grade of coal is being considered, and the possibility of using the poorer grades, such as "slack," which may be converted into perfectly clean gas, away from the furnace, forms an advantageous arrangement indeed.

During the progress of a heat in the open-hearth furnace several phenomena are observed which do not occur in hot air furnaces. One is the visible fermentation taking place in the bath. This latter is especially distinguishable in heats where the charge is rich in graphitic carbon. White iron does not act in this manner. The cause for this phenomenom may be explained by the fact that with the evolution of gas generated by the combination of oxygen and carbon, small particles of iron are drawn to the surface, and burning there for a moment with bright scintillation disappear as the gas has spent its energy, when there is nothing left of these particles of iron to attract gravity. This latter feature is of course one of the principal reasons for furnace losses in melting. As this action increases the iron in bath coagulates or becomes granular. This feature will also appear on the top of ladles, when iron has been superheated. This furnace, as before stated, is most suited to the casting of heavy work, and often during the progress of heats a small quantity of ore has been introduced as an advantage in reducing carbon, etc. This should be used, however, with great caution, as the reaction being very positive, if used too strongly, will produce dull metal, as the latter has already lost considerable of its carbon and silicon.

The road to a direct metal in malleable (thus avoiding the long annealing process) lies in this direction. This metal must be low in carbon, etc., and still have fluidity to run in green sand molds. This has been the stumbling block in every experiment tried in this connection. There has been no difficulty in producing a low metal, but it was always a "mongrel" steel, requiring a hard mold, and of course it is easier to anneal castings than to dry molds. Therefore the field is still open. The open-hearth furnace is not restricted to the use of producer gas, but natural gas and fuel oil may be used, there being but very slight mechanical changes necessary for their adoption.

The annealing of malleable cast iron is a very lengthy operation, and many unsuccessful attempts have been made to shorten it. Its duration may be said to vary with localities and mixtures, for we hear of firms whose practice is a four-day anneal, while others require ten, and claims are made that the patterns are similar. The annealing oven is of very simple construction, there being nothing in its operation which requires high operative ability. Its only chance for success depends wholly upon the condition of the metal in the castings, as they come from the melting furnaces. It possesses no power whatever to change the chemical and physical complexion of the metal, beyond the elimination of certain percentages of carbon and silicon. We often hear of metal being "burnt" in the annealing. No metal can be

burnt unless it is brought into direct association with a reducing flame, and should the metal have the appearance of burnt iron, it may be depended upon such was the condition of the metal when tapped at the melting furnace. The annealing oven cannot overcome any defect arising at the time of casting. There is nothing but heat in the ovens, and nothing but heat will affect the annealing. And again, much is insured in the quality of metal by the time allowed the furnaces to cool down. The only chance for material change in the annealing is the small operation or reaction due to charging packing with sal-ammoniac, etc., and this action will be uniform. There are times when some of the iron charged into ovens will be perfectly annealed, while other parts will be hard iron, but this would seem a faulty construction rather than inequality of the metal. In an oven, when the annealing is uniform, it is impossible for some iron to be burnt and the balance be found in perfect condition. Beyond a certain set limit the annealing furnace has no power whatever to influence the complexion of metal. A furnace may be driven hard enough to cake all the packing, yet the iron has been very ductile indeed. This phase is often met with. Annealing ovens may be fired with any material which will furnish the degree of heat required. Coke, coal, oil, natural and producer gas, all work satisfactorily. In general practice the heat required is between 1,500° and 1,900° Fahr.—"Furnaceman," in Iron Trade Review.

The Machinist and the Molder?

I believe I have been learning something about the way to read the American Machinist. I suppose I have been like a good many other readers, and have generally assumed that only that part of the paper that bore upon my own trade or special line of occupation was for me to read, and that I could skip the rest without losing anything. Being a machinist of the machinists, I of course always read everything that comes along about machine shop work and ways, but what have I got to do, for instance, with foundry articles? It is very certain now that I will never be a molder, and therefore all that tells about ramming sand and venting cores and melting and pouring metal is so much waste paper to me.

That is the way I have been feeling all along. The machine shop has been the one fact, and almost the sole factor, of all machine production, and it has had in my mind all the glory for all that has been done. When any fine machine is turned out, or any successful machine if not so fine, a Corliss engine, a printing press, a power loom, a locomotive or a steamship, what is either of them but a product of the machine shop? The iron or steel or brass castings, the forgings, the piping, the boiler work, and all the rest, come to the machinist simply as raw material, the machinist then does the work and deserves the credit. That's the way I have been thinking, and it's beginning to dawn upon me that I have been considerably wrong, and on account of it I have missed learning several things that I might have known and that would have done me good and have been of use to me; and if I now give myself a little talking to, it may not be bad for some of the other young fellows who are disposed to make the same mistake that I have been making.

Just the reverse of my habit about reading and learning I suppose would have been more correct. Whatever information may be contained in any article is intended first of all for, and should be of the most value to, the one who does not know it all. It is not always that the machine shop matter contains anything new to me, or really helps me, but I can seldom read a good molder's article without not only learning something that I did not know, but receiving also additional reason for respecting the molder more. If the trades can be introduced to each other and learn to know more of each other's trials and needs in working, and especially if the molder and the machinist can know each other better, it will tend to their mutually better understanding and appreciation.

The machinist and the molder are constantly associated, and you might say that they work side by side, and they certainly ought to know and respect each other better. I suppose that the great reason that they don't is because their work is so different. It is so different that the one is almost an absolute contrast to that of the other. The work of the lawyer or of the doctor, or of the clergyman, does not differ from that of the machinist. The mental attitude of the one toward his work is as different as possible from that of the other. One deals

with certainties and the other with uncertainties. The machinist uses precise measures and movements and secures absolutely certain results; he knows just what he will have when his work is done. In turning a piece in the lathe he rotates it at a certain speed, he gives a certain feed to the tool, with a certain depth of cut, and there is absolutely no chance to question what will be accomplished. He can stand in perfect confidence and see the operation go on. Nearly all of his work has the same atmosphere of certainty about it. He is told, or he knows in each individual case, precisely what to do and how to do it, and what he is to have when done, and things come out invariably as planned.

The molder necessarily employs means and methods neither of which, according to the machinists' standards, are accurate or to be relied on, and the results are always in question until the last operation is completed. The daily pouring off is more or less of a lottery, after all, with a tolerable certainty of more or less blanks in the drawing. The occupations, all through, of the machinist and the molder are, I suppose, as different as are those of the banker and the stock broker.

Perhaps there is no better lesson near at hand as to the difference in the ways and methods of the machinist and the molder than is to be found on the one side in recent articles in the American Machinist upon die construction by Mr. Painter and others, and on the other side in the foundry articles by Mr. Palmer. "Molding a Wheel Segment," appearing in a recent issue, just gives an idea of the unprecision in every detail of the operations, of the multiplicity of such details, each involving an act of judgment apparently closely allied to guesswork, and yet after all of the astonishing reliability of result. A build-up, true-running flywheel is one of the jobs which, when finished, the machinist is habitually proud of, and just as habitually regards as his triumph exclusively; but, after this, when I see one of those wheels I will be ready to take off my hat to the fellow that made the castings.—Tecumseh Swift, in American Machinist.

The height of the charging door has more to do with fuel economy than the shape of the tuyeres.

The History of Steel Manufacture in Sheffield.

At the occasion of his installation as master cutler of Sheffield R. A. Hadfield, himself one of the best known manufacaurers of steel castings in the world, delivered an address in which he sketched as follows the development of steel manufacture in Sheffield:

The question may naturally be asked, What led to Sheffield becoming such an important manufacturing center? It is well known that there are evidences of numerous ancient workings of iron ore in the district; the Romans themselves had taught the British much in this respect, and the Normans, in their invasion, brought over many smiths and other skilled artisans. About the year 1100 one of the earliest Norman lords obtained a charter to erect forges for the working of iron at Kimberworth. Although of much later date, at the Wortley Iron Works of T. Andrews, F. R. S., there exists an interesting carved stone, bearing date 1713, showing a tilt hammer of the type then used. Dr. Gatty thinks that the Roman Rigg or Ridge, extending from Wincobank to Templeboro, had led to local iron stone being exposed, but inferior or phosphoretic ore, such as existed in this part of our country, could not have made good steel, whether worked up direct or made into wrought iron and carburized by cementation, as then practiced. While no doubt iron was locally produced, it would not have been suitable for steel of even medium quality. We are, therefore, driven back to the fact that in the early days Sheffield's products were almost entirely made from imported Swedish, German and other foreign steel. The material used was no doubt originally bought in its cemented condition, but afterward the cementation was done here. It was, therefore, due rather to natural advantages, such as the abundance of wood, and, later, the discovery of coal, that our manufacturing operations took root. In witness of this may be cited the intelligent observations of a Franchman, Jars, who visited Sheffield during the middle of the eighteenth century, and afterwards published an interesting account of his trip. Streams for working the grinding wheels used were also abundant, and generally the conditions of manufacturing were favorable; probably, however, a still more important feature at that time was

the accumulated special skill of its workmen, gradually aggregating themselves into associations and guilds.

That Sheffield trade became important at an early period must be admitted from the evidence of the well-known Chaucer quotations, probably about 1360, regarding Sheffield "Thwitels." Again later, Lord Shrewsbury, when presenting Sheffield made knives to Lord Burleigh, wrote: "Such things as this poor country affordeth with fame throughout the realm." Still earlier may we not claim for Sheffield manufacturers an important position as makers of munitions of war in the shape of projectiles—to wit, arrow heads? Tradition says that the victories gained at Crecy and Agincourt were due to the Sheffield projectiles of that day being too much for the French armor! Johnson, the antiquarian, found a record which stated that Sheffield had at that time furnished to the government no less than 5,000 arrow heads at a price of 15 pence per 100. In face of this evidence of the quality of Sheffield's work the prowess of Robin Hood and Little John can easily be understood!

As regards the materials used in the manufacture of cutting instruments of all kinds, it is clear that long before the time of Huntsman, who effected the first important advance in the manufacture of cast steel, the city drew these entirely from outside, or, at any rate, those from which high quality goods were produced. This is confirmed by the statement that in 1750, or 150 years ago, no less than 4,000 tons of Swedish iron were worked up here. Supplies are also said to have come from Spain. Probably after this important trade first commenced some of the material was converted into blister steel at the then port of entry, Newcastle. M. Gabriel Jars, in his "Voyages Metallurgiques, 1764-1774," states that there were then several manufacturers of steel at Newcastle-on-Tyne—that is, the cementation of imported bars was carried on at that city. This process, without doubt, originated on the continent. There are also records that even the South of England contained steel works—that is, cementation furnaces—for ancient records show that in 1609 one John Hawes held the site of the Abbey of Robertsbridge, Sussex, upon which were eight steel furnaces.

It was probably about 1730, or a little earlier, that Huntsman commenced his experiments, which resulted, owing to his labors primarily, and to those of others later, in the present successful condition of the high quality steel trade for which Sheffield is justly famous. Probably more of this crucible steel is produced to-day than at any time in our history. Notwithstanding the rapid march in metallurgy and in the introduction of new processes, these, while meeting other requirements, have not destroyed the crucible steel industry for which Sheffield has been so famous since the time of Huntsman. As some have questioned the importance of Huntsman's work, the late Dr. Percy, who has special claim to authority, said: "So far as I am aware, steel was never melted and cast after its production, and in only one instance, that of Wootz steel, was it ever molten during its production, so that for the practical solution of this problem we are indebted to Benjamin Huntsman, of Sheffield." While the mere melting of materials in crucibles was not novel, his invention consisted in successfully solving the great difficulties to be overcome before this could be applied to the practical production of steel. Probably his skill lay largely in producing crucibles of sufficiently refractory nature to withstand the high temperature of the melting operation; also in finding the correct type of melting furnace and the flux to be used, the latter a point then of special importance. By the trade this method is still often called "steel refining," though, of course, in the sense of purification this term is not quite correct. The great drawback then experienced by manufacturers was that while imported material from Sweden and Germany was of excellent purity, whether as bar iron or crude steel, the cementation process employed to effect the change, or "convert" the bar into steel or blister steel, gave a production of uncertain temper. The Huntsman method of fusion obviated many of the difficulties met with in the cementation process, and it certainly proved to be the first practical solution of the important problem of how to make steel of homogeneous and uniform quality. M. Gabriel Jars in 1764 described how the blister steel was fused, the method being practically the same in many points as that employed to-day in the crucible process. It was thought that the flux used formed the great secret, and much rejoicing occurred when some one found this to be ground bottle glass. M. Jars describes how this special steel was

then only used for the best razors, some kinds of knives, the finest steel watch springs and watchmakers' small files.

In 1787, or only ten years after Huntsman's death, Gale's Sheffield Directory showed, by the five or six firms entered under the heading of "Steel Refiners," that the men of Sheffield had not been slow to take advantage of the improvements effected by Huntsman. It may be of interest to add that there were in that year about a dozen firms engaged in the converting or cementation process. Also about 50 makers of edge tools, 40 of files, 300 of pen, pocket and table knives, 50 of razors, close upon 100 of scissors and some 60 to 70 engaged in the manufacture of scythes, sickles and shears. Names of manufacturers at that time engaged in the Sheffield trades are well known even now, and their existence to-day, as of many other old firms, is, I think, a good proof that the motto of our Cutlers' Company, Pour y parvenir a bonne foi, has faithfully represented their aims. That the city has made continued progress in this special manufacture is shown by the following figures: In 1835 there were 56 converting furances and about 564 melting holes; in 1842 there were 97 converting furnaces and about 777 melting holes; in 1856 there were 105 converting furnaces and about 874 melting holes; in 1899 there are probably at least 2,000 to 2,500 melting holes. When it is considered that in 1850, or 50 years ago, it was thought to be a great feat when Messrs. Turton, of the Sheaf Works, produced an ingot weighing 25 hundredweight, afterward shown at the great exhibition, well may we exclaim that times have changed and we with them. Although it is difficult to fix an exact figure, it is probable that 1,000 tons of crucible cast steel are each week melted in Sheffield, involving the use of about 14,000 crucibles. Huntsman would indeed be astonished to find his child grown into such a giant. As regards the development of the modern steel making process and other kindred trades, these are all well known and need not be dealt with in this address.

Sheffield has done much as a metallurgical center, both as regards commercial progress in its own interests and as to adding general scientific knowledge to the world's stock. The days of Huntsman saw the commencement of steel manufacture; his methods have been adopted in many other manufacturing centers; while, as regards the revolution effected by Bessemer, to whom the world at large is greatly indebted, much as we owe to him, I venture to think that if it had not been for the pluck and perseverance of practical Sheffield men, who assisted him in the development of his process, it would not have so rapidly attained the remarkable success it has done. Among men who, by their business qualities or inventive abilities, have helped Sheffield to attain its present high position in the metallurgical world are Brown, Jessop, Cammell, Firth, Reynolds, Vickers, Wilson, Andrew Fox, Seebohm, Howell, Doncaster, Colver, Jonas, Osborn, Sanderson, who carried out steel alloy experiments for Faraday, Mushet, Lucas, who was one of the first in 1815 to perfect malleable cast iron; Spencer, Stubbs and others; also those who have come into our midst from abroad and have done well for our city by their business acumen and energy. I have dealt above with those names specially associated with the manufacture of steel. In its kindred branches and other industries there are equally well-known manufacturers of long standing repute, such as Rodgers, Pelk, Richardson, Chesterman, Wolstenholme, Bingham, Mappin, Britain, Bedford, Tyzack, Beardshaw, Cadman, Harrison and many others.

What is the Remedy?

I have been having some difficulty in obtaining light brass castings free from porous spots. When the gates are made large the oxide enters and makes the castings porous, and when small gates are used the unequal thickness causes a heavy shrinkage to take place. The addition of a small quantity of aluminum reduces the oxide, but increases the shrinkage. The mixture I have used ranges from 33 1-3 to 40 per cent zinc, 3 per cent lead and the balance copper. What changes shall I make in this mixture to obtain the best results? THOS. LAWSON.

The Simpson Iron Co., of Columbus, O., manufacturers of hardware specialties and iron novelties, in referring to a recent inquiry in these columns concerning manufacturers of furniture trimmings, state that they make a specialty of this class of goods, having in hand as many as 75 or 80 different designs, and supply some of the largest furniture manufacturers with castings.

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Trade Outlook.

It goes without saying that it has been a long time since the foundry trade has started upon a year of greater promise. The first thing needed for prosperity in any trade is plenty of work. With a shop full of work there is not the inclination to work for glory that there is when competition causes the sacrification of profits in order to keep a shop running. At the present time there is plenty of work for every shop that is managed right. Some foundries have been started that will go under sooner or later, but this is caused by faults in the personnel in charge of these shops, and not by conditions of the trade.

Considerable complaint is still heard from different quarters regarding the scarcity of material. This applies especially to coke and is in many cases caused by the shippers' inability to obtain a sufficient number of cars to fill orders with the usual promptness.

How far the demands of labor for future concessions will affect the different industries is problematical. While no severe interruption is to be anticipated in the foundries, it is to be remembered that hostilities in one line of industry affect the tranquility of others. A reasonable course upon the part of employer and employes alike to meet each other half way will tend to minimize the results which always follow a struggle of this kind.

After Information.

Not only are the methods employed by American manufacturers in their machine shops being investigated by European competitors, but the practice existing in our foundries are also receiving due attention.

The large output per man in foundries devoted to specialties is attracting more than a passing interest, and that this is not a temporary fancy is reflected in the number of American molding machines shipped abroad.

As to how far the workmen on the other side will enter the spirit prevailing here to get as much work as possible from a machine remains to be seen. The mere installation of the machines will not in itself be a guarantee that their performance shall equal their home record. Humanity remains to be dealt with, and this is an uncertain quantity on which more than one proposed improvement has been foundered.

Some Things that are Queer.

It is a pity that but few practical foundrymen ever get the chance to visit shops working under all sorts of conditions. When the practical man happens to obtain a week's vacation he, of course, tries to spend his time to the best advantage, with the result that he goes where they have something worth seeing in the way of appliances and output.

One of our friends has recently visited a great number of foundries of all kinds and he says that he has met many men in charge of forty or fifty molders who puzzled him as to how they managed to hold their jobs. Approaching one of these our friend advanced the opinion that he ought to be in receipt of a good salary for the amount of work he had to do, to which the foreman replied, that he was doing pretty well, getting $2.75 and being promised $3. Upon being informed that a great many molders were receiving more than $3 per day, this foreman acknowledged such was true, that

they were paying their own men $2.80, but that he would rather run the shop at $2.75 than work on the floor for $2.80. Our correspondent informs us that this party was on the fly all the time, trying to make up in motion what he lacked in good management.

Some proprietors like to see a foreman digging at something all the time, although it is to be remembered that no really first-class foreman ever makes a windmill of himself. The biggest part of the foreman's work can be done without attracting the employers attention, except in so far as it shows in the final output. One thing is sure, the workmen who will accept the position of foreman at less pay than he is able to earn as a journeyman, is neither a good workmen nor a competent manager. The laborer is always worthy of his hire, and this applies to shop foremen as well as to the men under them.

Just to show what unconsciously humorous "cusses" are engaged in the foundry business, our correspondent relates the following:

"One shop I visited wanted a foreman and here is the qualifications they sought at the munificient salary of $80 per month: 'Their ideal should be a first-class molder, away up in cupola practice, be able to mix all grades of iron satisfactory to their customers, competent to handle labor to the best advantage and get work out of the men. Lastly, he should be a non-union man, six feet tall or more, and weigh in the neighborhood of 250 pounds.'

"I smiled when I heard the last requirement and asked them why they desired a man of such gigantic proportions, to which they replied that they thought a large man could control those under him better than a small one and get more work out of them. I told them that some of the best and most successful foundry managers of the present day were small men, who had the brains to lead their workmen on to obtain results instead of trying to drive them by an exhibition of their bullying powers. I finally told them that the best way to obtain their ideal foreman would be to go down on the water front and pick up a big dockwalloper and educate him up to their standard."

Where the Foundries of the United States are Located.

Statistical information is always more or less interesting when it concerns one's own trade. From an exceptional careful canvass which we have recently made we find that there are four thousand one hundred and forty-five (4,145) foundries in the United States in which iron is melted. These range all the way from the small country plow shop, running maybe a heat once in three months and sometimes even less, to the big concerns melting hundreds of tons daily.

All the states and territories of the Union are represented as consumers of pig iron with the single exception of Wyoming, in which state we have failed to find a foundry of any kind. Even far off Alaska is credited with one foundry located on Douglass Island. This shop is operated by a mining company, who doubtless conduct it more for the sake of obtaining repairs in short order than for the actual profit to be found in the business itself. Certainly pig iron and coke must come rather high in the neighborhood of the Arctic circle, and it would seem as if, eliminating the question of time, castings could be purchased cheaper than they could be made.

Although small shops are as yet in abundance in all parts of the country, flourishing with more or less success, nothing is more certain than that the real old-fashioned backwoods foundry, which makes a living by trading a few plow points and other repairs for a load of wood with an old stove thrown in, is doomed to extinction. In the first place these shops in the majority of cases do not understand their business. Their product is hardly ever satisfactory. In trying to make castings without buying any pig iron they naturally strike a snag. Again, the transportation facilities of the country are constantly being improved and repairs can as a general thing be promptly obtained. A third cause operating against the small shop is the inclination of manufacturers not only to have repairs ready for immediate delivery but also to dispose of these at reasonable prices. There was a time when the manufacturer attempted to obtain extortionate prices from those who purchased his machinery and were unfortunate enough to need extra castings afterwards. In doing so he hurt his own interests and destroyed a source of revenue, for repairs can be readily disposed of at a fair profit and still be sold at a great deal smaller price than would suffice for the jobbing shop, which must make single pieces where the original manufacturer has all the advantage of turning out work in large quantities on the interchangeable plan.

According to the number of iron foundries they contain, the states rank as follows:

Pennsylvania	646
New York	515

WHERE THE FOUNDRIES OF THE UNITED STATES ARE LOCATED.

Ohio	400
Illinois	298
Michigan	230
Indiana	185
Wisconsin	173
Massachusetts	169
New Jersey	136
Iowa	101
Connecticut	98
Missouri	95
California	88
Minnesota	87
Virginia	71
Tennessee	61
Alabama	56
Kansas, Maryland and Texas, each	55
Kentucky	53
Georgia	50
Maine	46
New Hampshire	36
North Carolina	35
West Virginia	34
Vermont	33
Colorado	30
Rhode Island	29
Nebraska	27
Louisiana	23
Washington	22
Arkansas and Oregon, each	18
South Carolina	16
Mississippi	15
Delaware and Utah, each	12
Florida, Montana and So. Dakota, each	8
District of Columbia	7
Arizona and North Dakota, each	6
Nevada, New Mexico and Oklahoma Territory, each	4
Idaho	3
Indian Territory	2
Alaska and Hawaiian Islands, each	1

The five states of Pa., N. Y., Ohio, Ill. and Mich. have 2,089 foundries, or a little over fifty per cent of the total. In geographical location fourteen southern states, including Arkansas, Maryland, Texas and West Virginia, have 550 foundries, or nearly a hundred less than is to be found in Pennsylvania alone, the latter state more than proving its claim of being the banner domain of Uncle Sam in iron manufacturing and leading New York by 135 foundries.

The fourteen northern states laying east of the Mississippi and north of the Ohio, excluding Delaware and the District of Columbia, have within their borders 2,944 foundries, or nearly seventy-five per cent of the total number. While the southern states have made great gains it is to be noticed that the foundry interests of the northern states have advanced at an even more rapid gait.

Chicago leads as the principal center of foundries in the United States, having 83 iron foundries to its credit, Philadelphia being second with 75, and Pittsburg third with 54. New York and Brooklyn together have 73 foundries. In point of numbers the foundries of Chicago equal the total to be found in fifteen states and territories. In point of volume of trade, or in other words, taking into consideration the amount of iron melted, the Chicago foundries equal the total output of about twenty states. All the foundries of Virginia, the leader of the southern states, could be placed in Chicago without causing a ripple and it would require those to be found in the state of Delaware to balance the scale in point of numbers.

The Kranks' Korner.

SMALL FOUNDRIES IN ISOLATED LOCATIONS.

A correspondent writes for information concerning iron mixtures carrying a large per cent. of scrap. He says that his shop is in a small village in Alabama, and that he is obliged to purchase pig iron in less than carload lots, and that it costs him about $16 per ton! This is fully twice as much as his city competitor pays. It is therefore no wonder that he wishes to use as much scrap as possible in his mixture. Our correspondent could not have applied for advice to any man more willing to help him than the present writer. We have had experience in several just such shops as his, and so, we can sympathize with him fully in his unfavorable situation, and, in hope of being helpful to him, and perhaps to many others similarly situated, we will here discuss ways and means for successful founding on a small scale.

Just thirty years ago this winter the writer was working at molding in a little foundry in a small city in Minnesota. Just a few weeks since he received a letter from his former employer, stating that the foundry was still in operation, under the same management as of old; but he complained that the country shop found it more and more difficult to compete with the large concerns located in the great cities. This is undoubtedly true; the economies possible to the large concerns are out of the question in the small shops generally; still, there is a place for the country shop, and there is work for it to do. From 1876 to '80, we conducted a little country shop, doing all sorts of repair work, for machinery, stoves, etc., manufacturing tread-powers, sugar ket-

tles, etc., etc., and during the whole four years we never saw a piece of pig iron! Our castings were nevertheless, quite as good as the average foundry, using pig iron, produces to-day. But the scrap of to-day is not so uniform as it was then, and so, it becomes necessary to use more or less pig iron in the mixture. But the important question is, what shall the pig iron be? That is, what grade of pig iron is most economical for use in this particular case? Every time iron is melted and cast, some of the graphitic carbon is changed to combined carbon; and this makes the iron harder than it was before. Generally speaking, for country shops, this is detrimental if we start with all scrap; it is one remove too far from the requisite degree of softness. What can we do to prevent this at the least cost?

You can get iron containing all the way from less than 2 per cent. up to 8 per cent. silicon. No. 1 foundry iron contains about 3 per cent. silicon; No. 2, about 2½ per cent. Eight per cent. silicon iron costs about $2 per ton more than No. 1. Either of these irons will answer to mix with scrap; but, in the case of our friend, there can be no doubt that the 8 per cent. iron is the most economical for him to use, because, with a less number of pounds he can get the amount of silicon required to maintain the softness of the product. Bear in mind that it is freight that costs him so heavily. When we were conducting the little foundry above referred to, we paid $16 per ton for coal at the shop—but more than half of this was for freight. In the case under consideration we wish to restore to our iron mixture, say, 1 per cent. of silicon. We can do this with iron containing 3 per cent. silicon, or 9 per cent., but it will take, of course, three times as much of the former as it would of the latter, to do this. Assuming that we stand upon an equality with our city competitor as to the matter of scrap, and that all our scrap needs is an addition of silicon to make it just as good as any other iron, the question is, what is the cheapest way to get the silicon?

Eight per cent. silicon iron costs about $2 per ton more than No. 1 foundry, which contains 3 per cent. silicon; but the freight per pound is the same in both cases. We wish to add 1 per cent. of silicon to the mixture; therefore, if we mix about 100 pounds 8 per cent. silicon iron with 800 pounds scrap, the mixture will cost, say

800 pounds scrap at 40c	$3 20
100 pounds 8 per cent. silicon at 82c	82
Total	$4 02

But if we use the 3 per cent. pig, in order to add 1 per cent. of silicon to the 900 pounds of mixture, we shall have to use three times the weight of pig iron, which, as our friend says, costs him $16 per ton, (2,200) equals about 73 cents per cwt., therefore, the mixture would cost

600 pounds scrap at 40c	$2 40
300 pounds pig at 73c	2 19
Total	$4 59

The net cash saving would thus appear to be about $1.40 per ton of iron melted, by using the 8 per cent. silicon iron. One of the largest pipe founders in the country once said to the writer: "If we can make one dollar a ton on pipe, we're in it."

It is by studying all the nice economies of founding that profit is made to-day. But, this is not all that is to be said in favor of using high silicon pig in the country shop. Pig iron, and transportation, require "cash on the nail," while the country founder can very often barter for a large part of the scrap that he uses; and this is a very important item to him. Let me warn the purchaser to demand a guaranteed analysis of the pig iron that he buys, in order to guard against disappointment; for, the small buyer cannot afford to meet with any set-backs.

* * *

The above article is taken from the columns of The Tradesman, the author being E. H. Putnam, one of America's prominent superintendents. I have reproduced the whole article here in order not to be accused of hacking it to pieces and appropriating just what portions I needed. The article appeared some time ago, when pig iron was considerably lower in price than it is to-day, but a press of business in the line of shoveling sand has kept me from taking up the points I wish to discuss until now.

* * *

I believe it was my friend, Mr. Keep, who once said, that it was a poor policy for a small foundry, using considerable scrap, to try and regulate its mixture by figuring upon its silicon contents, because the mixture besides being affected by other causes and elements beyond silicon, would also be difficult to control by this method on account of the lack of uniformity in the scrap.

Of course every reader of THE FOUNDRY knows that Brother Keep favors a physical test or the regulation of the mixture of iron through the measurement of its shrinkage. Quite a few people consider Mr. Keep a sort of a krank on this subject, but after all is said the fact remains that a physical test will regulate a mixture, and secondly that the ability to figure up the silicon contents of a mixture, granting that it is known in the different grades of pig iron and scrap,

is not possessed by even some of our best foundry superintendents.

* * *

Mr. Putnam's idea, that, as a softener, it is more economical to use a pig iron high in silicon than one containing a lower percentage of this element is correct and one with which I fully agree. What I take exception to is his method of figuring the silicon contents of his mixture. In this I am going to prove him to be in error.

* * *

Taking his first example, where the mixture consists of 800 pounds of scrap and 100 pounds of 8 per cent. silicon pig iron, we will suppose that the scrap contains 1½ per cent. of silicon when we have 800 pounds of scrap containing 12 pounds of silicon and 100 pounds of pig iron containing 8 pounds of silicon, or a total amount of 900 pounds of pig iron containing 20 pounds of silicon, or an amount in the mixture of the latter element approximating 2.22 per cent., and not 2.50 per cent., as Mr. Putnam's . would lead us to believe. The error of the author lies in supposing that the 8 pounds of silicon in the pig are added to the scrap alone, whereas in introducing these 8 per cent. of silicon he has unconsciously at the same time also added 92 pounds of iron and neglected to provide the latter with a silicon contents at all.

* * *

This error will be all the more discernable in the second set of figures. Here we are supposed to have 600 pounds of scrap, which we will also figure as containing 1½ per cent. of silicon. This would make the silicon contents 9 pounds, to which we add 9 pounds of silicon found in the 300 pounds of 3 per cent. silicon pig, when we have 900 pounds of iron containing 18 pounds of silicon, or 2 per cent. of silicon, instead of 2.50 per cent., the author's error again hinging on the fact that while he added the 9 pounds of silicon to the 600 pounds of scrap he also at the same time added 291 pounds of iron for which a silicon contents must be provided.

* * *

For an illustration I have supposed that the scrap contained 1½ per cent. of silicon. For the reader's interest I will say, however, that any other silicon contents may be chosen and a little figuring will convince the investigator that the addition of 100 pounds 8 per cent. silicon iron to 800 pounds of scrap will fail to increase the silicon contents of the mixture one per cent.

The two examples given, which are supposed to be analogous, clearly prove that the author never checked his own figures.

* * *

My idea of illustrating the benefit accruing from using a high silicon iron as a softener would take the following form, assuming that the scrap contained 1½ per cent. of silicon, which I desire to increase 1 per cent. in the castings:

NO. 1

800 pounds scrap (1½ per cent. silicon), at 40 cents	$3 20
146 pounds 8 per cent. silicon iron, at 82 cents	1 20
Total, 946 pounds of iron containing 2½ per cent. silicon	$4 40

In example No. 2, where we are trying to obtain a mixture with the same silicon contents but through the use of an iron containing but 3 per cent. of silicon instead of 8, we have the following figures:

600 pounds scrap (1½ per cent. silicon), at 40 cents	$2 40
1,200 pounds 3 per cent. silicon pig, at 73 cents	8 76
Total, 1,800 pounds of iron, containing 2½ per cent. silicon	$11 16

* * *

Before we can increase the silicon contents of 800 pounds of scrap containing 1½ per cent. of silicon to 2½ per cent we must add 146 pounds of 8 per cent. silicon iron (not 100 pounds). Taking the second example where we have 600 pounds of scrap containing 1½ per cent. of silicon we must in order to increase the silicon contents to 2½ per cent. add 1,200 pounds of 3 per cent. silicon iron instead of 300 pounds, according to Mr. Putnam's figures. In the first example I have shown we have 946 pounds of iron containing 2½ per cent. of silicon at a cost of $4.40, or slightly exceeding 46½ cents per hundred pounds. In my second example we have 1,800 pounds of 2½ per cent. silicon iron at a cost of $11.16, or 62 cents per hundred pounds. This shows a difference of 15½ cents per hundred

pounds in favor of the use of the high silicon iron, granting of course that the prices given approximate the actual cost of iron. Per ton of castings this would amount to $3.10 instead of $1.40, given by the author.

* * *

I have written the foregoing with no intention of showing my ability as a mathematician, but to expose the mistakes that are likely to occur when even a competent foundry superintendent handles the calculating instruments in an effort to determine the amount of silicon that must be added to a mixture to raise this element to a certain point. The mistake Mr. Putnam makes in his second example is to overlook the fact that for every 3 pounds of silicon he adds to his mixture, he also introduces 97 pounds of iron, and this is how it comes about that 1,200 pounds of the soft iron is required to perform the duty which he has attempted to do with 300 pounds.

* * *

Another point that Mr. Putnam has overlooked is that there is a loss of silicon taking place during the melting operation, and that his loss must be compensated for by the addition of more soft iron if the resultant mixture is to show an increase of 1 per cent. of silicon. In this connection it is to be noted that all records point to a correspondingly greater loss in the high silicon iron than in the grades containing a much smaller amount of this element. Granting that this is so there is a greater cost attached to the first mixture than the figures indicate, although of course it would still show considerable economy over the second mixture.

* * *

The measurement of the shrinkage will afford a far closer indication of the silicon contents of the iron than any set of premature calculations can possibly do. Again, this can be done in far less time and with the chance of mistakes almost eliminated.

* * *

I have no doubt but that the majority of foundrymen have had, or should have had, sufficient schooling to calculate the amount of silicon in their iron mixture and the amount of different brands which they must add to obtain a certain result. I also know, from bumping up against such examples of miscalculation as shown herewith, that the average foundryman does not possess the ability to apply his schooling, when it comes to use it in a practical way.

* * *

There is a good deal of difference between working an example from the arithmetic on the school blackboard with a teacher at your elbow and working that same example with the aid of an old bottom board and a pièce of chalk on the cupola scaffold.

The Forecast of the Iron Trade.

(ARCHER BROWN, IN THE NEW YORK TIMES.)

We are completing the most prosperous and in all respects the most remarkable year in the history of the American iron trade. We are about to enter upon a year which will be quite as interesting, and, unless all signs fail, even more prosperous. The change we have passed through is little less than a revolution. Ten years ago the cost of American iron and steel was higher than in England and Germany. We did not even supply our own requirements, but were importing both raw and finished materials in substantial quantities. Mechanically we were superior to our competitors, but we had not conquered our own problems and were far from the leadership of the world. The Baring failure in 1890 started prices downward. The panic of 1893 did the rest. Then followed six years of as hard experience as a great industry ever passed through. Capital was wiped out by the millions. Furnaces and mills that were counted valuable properties became a liability rather than an asset.

But out of this period of storm and stress came the new era of American steel and iron making. Mechanically as well as commercially the whole industry underwent a revolution in those years. Necessity not only compelled economies, but aroused American energy and ingenuity, and forced better processes of manufacture. Those who still had capital to do with, and confidence in the future, replaced old plant with new, built everything stronger and heavier, and on most modern lines. Resources of raw materials were developed, and transportation problems worked out. At the end of the lean years, therefore, the American iron trade had been stripped of every element of weakness and was in splendid position to take advantage of the changed times that were to come. The terrible years of

depression had been a blessing in disguise. It was demonstrated beyond a doubt that with our natural resources we could produce when necessary, nearly every form of iron and steel in this country at a cost so low that we could lay the products down in England, Germany, and other continental countries and undersell the home makers. The whole industry was thus put on a new and sure foundation.

The first signs of revival were noticed early in December, 1898. Bessemer pig was then selling at $9.75, Valley furnaces. Grey Forge, $9.25. Pittsburg and Birmingham, $6.50. Standard 2, foundry was worth $11 at Philadelphia and at Chicago. Lake Superior charcoal iron sold at $11.50 at Chicago. Steel billets brought $15.50 in Pittsburg. Steel rails, $17 at Eastern mills. Common bars sold at 95 cents at Youngstown. The rise began very slowly, and no one was more incredulous of the genuineness of the revival than the managers of the largest companies. As a consequence, contracts in great volume were taken in the early months of the current year at prices ranging from 10 to 25 per cent. advance on the average of 1898. At the close of the year not a few of the big concerns are dealing with remnants of these old contracts. Pig iron is being delivered in Pennsylvania to-day at $11 per ton, which costs the furnaces making it $13 to $15. Railroads are laying new rails at a cost or $17 or $18 and selling old scrap rails at $25. Stockholders in the various companies have wondered at the slow rise of the average net price of monthly shipments, and no little criticism is heard of the folly of those early low-priced contracts. Wisdom is easy after the fact.

The close of the year finds steel billets worth $33 at Pittsburg. Rails, $35 at Eastern mills. Common bars, $2.10 at Youngstown. Grey Forge, $16 at Birmingham and $21.25 at Pittsburg. Bessemer pig, $24.65 at Pittsburg.

Dec. 1, 1898, there were 195 furnaces in blast, with a weekly capacity of 235,000 tons. The year closes with a weekly production of 295,000 tons. The year began with a 12,000,000-ton pace, and ends at a 15,000,000-ton pace. The stocks at the furnaces and in warrant yards Jan. 1, 1899, were about 900,000 tons. The end of the year finds in furnaces and in warrant yards scarcely 110,000 tons. So rapid a shrinkage of stocks was never before witnessed in this or any other country. The year's production will prove to be close to 13,500,000 tons, a gain of about 17 per cent. over the previous year. This percentage of gain, it might be added, was almost exactly foretold in the early spring by close observers of the conditions surrounding furnace production. As our exports of pig iron for the year scarcely exceeded 200,000 tons, and there was practically no importation, it is easy to arrive at our actual domestic consumption of pig, viz., 14,250,000 tnos. Twenty years ago the Hon. Abram S. Hewitt in a public address predicted that in 1900 the United States would produce 15,000,000 tons of iron and the world's production would reach 35,000,000 tons. It seemed a prophecy as rash as its fulfillment now seems striking.

Before turning from the record of the new year to the prospects for the new year, it will be interesting to see what has taken place in England and Germany, our great competitors on the other side of the ocean. Great Britain produced in 1898 8,631,151 tons. Latest statistics indicate that the current year's output will but slightly exceed this figure. At the beginning of the year the total of stocks in public stores in Great Britain was 686,000 tons; Dec. 1 it was 557,000 tons, a decrease of 123,000 tons. As stocks were going off, however, in December about 1,500 tons a day, it would indicate a total reduction for the year of something over 20 per cent, leaving the aggregate stocks the lowest Great Britain has seen for over a decade. Warrants at the close of 1898 were bringing 48s. 10d. for Scotch and 43s. 6d. for Middlesborough No. 3. The market reached 73s. in the former and 71s. in the latter early in the summer, but is now ruling around 67s. and 65s., respectively. In Germany the production of 1898 was 7,232,988 tons. The increase of this year is estimated at about 1,000,000 tons. The percentage of the United States in the total world's product in 1898 was about 33 per cent. This year it will be over 36 per cent, and in 1900 will easily reach 40 per cent. Mr. Carnegie reminded the British metal trade in an interview published in London some months ago that they would find themselves handicapped before long for want of raw ma-

terial. The ready response of the United States to the enlarged demand contrasts sharply with the slight increase in output in England under a rising market almost equal to our own.

Looking at the prospects for the new year, some things can be predicted with tolerable certainty. Other things that we would all like very much to know about are in doubt. It is pretty certain, for example, that there will be a very large increase of production of iron ores, coke, pig iron, steel billets, and rails, and in nearly all finished forms of iron and steel. Three things as it appears at the close of the year may operate to check this expansion: First, undue political agitation. Second, continuation of financial disturbances in Europe which has so disturbel our security markets in December. Third, anti-trust demonstrations in Congress. These clouds do not appear large or threatening at this writing, and unless they take more formidable shape the trade will be confronted with the fairest skies that have been before it for many a long year.

The question constantly asked from the head of Lake Superior to Alabama and Texas is whether current prices will last. Taking the whole trade together, they are easily 100 per cent higher than a year ago. It is natural to distrust the permanency of so great an improvement. While the year will open with the country bare of stocks (the entire available supply of pig iron being less than four days' requirements of the mills and foundries), and while our furnaces are sold an average of six months ahead, there are still open questions. Will the high prices check building enterprises? Will the increase of production overtake the actual consumptive demand? Will the powerful combinations have the effect to steady prices if weakness sets in? The answer to these questions, time only can give. However, it can be said on the first point that the testimony of a wide range of consumers is that there is no real sign of falling off in their business because of the high prices they must ask. At the same time it is admitted that a very large amount of engineering, structural, and other work is deferred because of high cost estimates.

On the second point, the increase of production in spite of strenuous effort in every department of the trade will be a less percentage than that of 1898. Nothing but a severe check to confidence is likely to hinder a proportionate increase in consumption. It must be borne in mind that it would take nearly 10 per cent increase in the output of pig iron to replace the 1,000,000 tons of stocks exhausted since 1897.

On the third point, we are dealing with conditions too new to base intelligent calculations upon. It is certain that a wholesale consolidation of small interests which until this year have been in fierce competition with each other, will remove one of the worst evils that the iron business felt in the past. Strong companies, free from debt and with ample working capital, have taken the place of comparatively weak concerns. There is a disposition to harmony of action between the great interests, and it is fair to believe that the ordinary vicissitudes of the trade will be dealt with more ably, intelligently and conservatively than in the past.

A word in reference to the rapid increase of cost. From the mine owner, through the vessel owner to the railroad handling the raw material, the labor at the mines and at the furnaces, the railroads handling the finished product—through the whole chain there is a demand for some of the profits that are supposed to be going. The latest and best estimate is that Bessemer pig, which was made on last year's prices of lake ore and Connellsville coke at under $10 per ton, will under new contracts cost at least $16 per ton. Foundry and forge iron in the districts supplied by lake ores and Pennsylvania coke will cost about as much. Coke has doubled in price and is hard to obtain at full figures. Lake ores are about 80 per cent higher. Railroad rates have risen an average of perhaps 25 per cent. The rise of labor in mines and at furnaces will probably average 30 per cent. It is easy to see that no considerable decline could set in without putting manufacturers on the wrong side of the account.

A very significant question is what the bearing of all this will be on our export trade. It is clear that we shall not do much in exporting pig iron, but the writer has always maintained that pig iron is not a natural product for us to export. Our victories in the foreign countries will be won in the various finished forms of iron and steel in

which American energy and ingenuity have achieved success. If the record of the year just closed is taken as a guide, we shall maintain our export business. In October our iron and steel exports were $9,593,453, or at the rate of over $100,000,000 a year. This is largely in the form of agricultural machinery, locomotives, wire, bicycles, iron and wood-working machinery, and many other highly finished products. Some of the largest machinery manufacturers in Chicago, Cincinnati, etc., report contracts for next year in excess of those of the past year, and at fairly satisfactory prices. English and German exports are increasing, but their cost has risen almost as much as our own. German coke, for instance, is contracted by the syndicates for 1900 at prices 60 per cent higher than in 1899. Practically the whole German product of pig iron for 1900 is also contracted. England, as shown above, is using at home and in her colonies more than she is making, and is taking freely from us. In Great Britain also the cost has risen sharply, both through higher labor and dearer coke. The belief in Glasgow is, that with the ugly Boer war ended, a period of great activity would be seen in the English iron trade.

Looking at the whole field, there is surely a superb opportunity before the iron and steel makers of America in the opening year of the new century, and there are possibilities for the years to follow which the imagination can hardly deal with.

Brass and Aluminum.

A recent exposition of the views of some Naugatuck Valley brass manufacturers on the metal aluminum shows some queer notions possessed by these Connecticut folk. According to a published report, one manufacturer stated that, besides little trinkets, the only article widely used in which aluminum can be employed advantageously is the opera glass. Another said that, owing to the difficulties encountered in manipulating the metal, he does not see an immediate future for it in this country. This, indeed, would make the outlook for the aluminum industry particularly gloomy if it were borne out by the facts; but happily these assertions are rather wide of the mark. Not less than 5,200,000 pounds of aluminum was produced in the United States alone in 1898, all of which was consumed long ago, enough surely to make a pair of opera glasses for every inhabitant of the globe, with some metal to spare.

The quick consumption of aluminum at the present time rather proves that it has an immediate future, and that it can and is replacing brass for many other purposes is evidenced by the new applications which are continually being mentioned in this journal. It was but last month that we cited the case of a manufacturer who was buying aluminum in car load lots, where he formerly bought like quantities of brass, the aluminum being the cheaper and easier metal to cast, and as the manufacturer is able to plate it, the metal better fulfills all the requirements and more cheaply than brass.

However, it is not the province of aluminum to entirely supersede brass or any other metal. Brass has been made for hundreds of years, and will probably be made for centuries to come. That aluminum will take the place of brass for many purposes seems tolerably certain, but to what extent this substitution will be felt by the brass industry only time will tell. Aluminum is a metal that can replace many substances which are utilized in the arts, such as stone in lithography, copper in electricity, steel and wood in boat building, iron in the manufacture of culinary utensils, and so on. The brass manufacturers in the Naugatuck Valley must be a little behind the times when they think aluminum is only fit for opera glasses, for certainly any metal man does not need a magnifying glass to determine that the consumption of the metal aluminum is increasing at an accelerating pace.—Aluminum World.

The Minimum Wage Rates.

BY C. A. COLLINS.

A newspaper dispatch from Pittsburg announces that the stove molders of that place will attempt to abolish piece work, through which the earning power of a molder varies from two to seven dollars per day, and to substitute therefor day work with a minimum rate of three dollars for eight hours' work.

The question of a minimum rate of pay will, to the end that justice may be done, call for the establishment of a minimum

degree of skill. The molder who can earn the minimum rate of pay or more when paid according to the amount of work he performs, may also be supposed capable of earning an equal amount when working by the day. But the man who falls below the minimum rate, when working by the piece, will just as surely fail to earn it under the day work system.

It has been one incentive to American workmen, to be paid in direct ratio to the amount of work they performed. Many of the methods by which the molder has earned high wages would never have been brought forth under a time paying system. The workman has been stimulated into devising labor-saving methods by the knowledge that these increased his earning power. This is one feature of our industrial conditions to which foreign competitors largely ascribe our ability to meet them on their own grounds.

Can this incentive to improve be retained under a system paying for time alone? Will the workmen continue to increase their output as much as possible? It would seem as if these questions must both be answered in the negative. The dollar is the motive power that causes every man to make his best effort.

The men engaged in any given trade are not susceptible of being equalized. Some are worth more to their employers than others. Taking a dollar a day from a mechanic who earns it and giving it to another one who does not earn it, will neither make the latter more competent nor will it cause the former to try and do still better. The minimum rate of pay, in so far as it tends to level the workmen and bring them within one grade, is just neither to the workman nor the man who employs him.

Of course, a poor workman will hail with delight any action which returns to him more than his dues. However, the employer is not interested in poor workmen. There are always too many in this class. The employer's interest centers in securing good mechanics. There is never enough of these. The good workman is always entitled to all he earns, and that he should be asked to release part of that, which is his by reason of skill and ability, can only be accounted for by supposing that the poor workmen outnumber those who are really competent.

Molding Sand.

To try to make first-class castings without suitable sand for molding is, to say the least, a futile labor. Of course? Yes, of course; but there are any number of foundrymen trying it just the same. They have not attended the meetings of the foundrymen's associations, nor have they been assidious readers of foundry literature. They simply show their own men castings made by some firm that knows how, and demand "Why don't we make such nice, smooth castings?" And when the foreman answers, "Because we haven't the right kind of sand," the look of incredulity shows very plainly that the employer thinks his foreman is trying to shift the blame from his own shoulders. But the foreman is right. You cannot make a fine surface with sand unsuited to the work in hand. You cannot make a nice-appearing light casting in sand suited to heavy work. With sand of the right kind, an apprentice in his first year will make a better-appearing casting than the experienced molder possibly can with the ordinary run of sand seen in the Southern foundries.

There are foreign ingredients in much of the sand used that render it impossible to make a perfect casting in it. Substances that repel the iron wherever the particles lie on the face of the mold, causing a more or less pitted surface. The natural inference drawn from this appearance is that the molder has somehow been careless in his work; and often the molder himself is deceived, until after days of the most careful and painstaking work, he is forced to the conclusion that some quality in the sand is at fault. But the poor fellow finds it hard to convince the foreman, and the latter in turn is totally unable to pass this excuse upon the employer. Of course, not all employers are this way, but far too many are.

In those foundries that have the highest reputation for excellent work, the quality of the sand, both for molding and for core making, receives prominent consideration. Long and expensive experience has taught them that the facilities must be adequate to the requirements in order to success, and they have long since ceased to expect the foreman and the molders to compensate by impossible skill for the want of means to the end sought.

The eminently successful foundry proprietor will keep himself posted to date on the progress of investigation in foundry methods and processes, and will adopt the practices necessary to the highest achievement.

Men are sometimes misled as to the cause of difficulty in core making. They often attribute their difficulties to the sand, when, in fact, it is the binding factor in the mixture that is at fault. Flour is a good binder; but it demands the best of judgment and care in its use or trouble will ensue. In many foundries flour is almost entirely abandoned in the core mixture and certain core compounds have been substituted, which give a good, solid, smooth, strong core that will not blow, and that will remove from the finished casting with the least of coaxing. I need not name any of these compounds, as they are advertised in most of the trade journals, and I should not like to name one without naming all; besides, it would be useless to specially inform a man, or rather, to try to inform one, who does not read any of his trade journals.

These core compounds are such that they will not produce gas when the molten iron comes in contact, and they are of such a nature that they serve to stick the grains of sand together until superheated, when their adhesive quality is destroyed, and therefore the core is easily removed from the casting.—The Tradesman.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

SHAKING OUT CASTINGS HOT OR COLD.

Question.—I would like to ask whether it adds to the strength of common agricultural gray iron castings to leave them in the sand until perfectly cool, or is there any advantage gained over the ordinary practice of shaking out hot. Our test-bars go to show that those shook out hot are slightly stronger?

Answer.—It does not make much difference in strength when small castings are removed from the mold if they are not red hot. The slower a casting cools from the fluid state until it ceases to be red hot the larger will be its grain. Strength depends almost entirely on the size of the grain and on the firmness in which they knit together, therefore, as your test-bars show the castings removed while they are red hot will cool faster and will have a slightly smaller grain and be a little stronger.

The reason for leaving a casting in the mold is not to make it stronger in the way a test-bar shows it, but is to prevent warping or the formation of internal strains. By slow cooling after the casting ceases to be red hot the particles have time to adjust themselves and have a less tendency to pull apart. A casting that would crack if shook out hot would not crack if left in the mold until entirely cold. The casting as a whole is therefore stronger, while the metal itself is slightly weaker.

In castings having heavy and light portions it is sometimes necessary to leave some portions covered and to scrape the sand away from other parts. The whole object is to so cool a casting that internal strains are avoided.

HARD SPOTS IN CASTINGS.

Question.—I am troubled in some heats with hard spots in castings that vary in size from 1-16 an inch round to ⅜ an inch. They are round like a bullet and double extra chilled, while the casting all around it will be soft and the round bullet can be dug out with chisel. It is so hard the lathe tools will not cut it. I use one-half No. 2 foundry pig and one-half apparently good scrap for the ordinary run of work, and on thin work I use more pig, and on very heavy chunks more scrap. The cases referred to were in heats that were charged half and half.

At first, three years ago, I was troubled with hard iron by not using enough pig. It seems to me that if a small piece of chilled iron got mixed up in the scrap and it was melted good it should mix in the ladle and neutralize with the pig iron. Will chilled iron mix good with pig iron without stirring in the ladle?

Can a heat of chilled iron be run by mixing three-fourths pig and get castings with uniform grade that can be worked in a lathe?

Answer.—It looks as though the iron spattered as it entered the mold and that the round drops were surrounded by the hot iron that afterward filled the mold. Such balls are often covered with a film of oxide which prevents the hot metal from melting it. When the casting is cold such balls of hard

suddenly-chilled iron will be found loose in cavities of the casting. This may be the cause of hard spots in castings. Just a slight variation of an iron mixture will often remove the tendency of iron to cool with all its carbon combined. A slight increase of silicon will often remove all white spots. If you have a small piece of chilled iron among your scrap and it is thoroughly melted it will mix and will have no influence on the casting.

A chilling iron will be very likely to run white in a thin casting, but in a heavy casting it will run gray if there is enough silicon present. To give a good chill the silicon is kept low and such iron will be hard. You can soften it just as much as you please by increasing silicon. It is hardly ever necessary to stir melted iron in a ladle, as the tendency is to mix without it.

The proportion of pig or scrap has nothing to do with the case. You can make just as good castings with all pig or all scrap if the silicon is proportioned right to produce the required quality of casting.

If there is not enough silicon in either scrap or pig iron you must add what is needed.

MELTING IRON WITH CHARCOAL.

Question.—A party offers to make me a quantity of charcoal (from hard maple). Can you inform me if I can successfully use it in the cupola for melting iron. Supposing the price to be not more than coke per ton, would it be cheaper?

Answer.—You can melt iron in a cupola with charcoal, but will have a great deal of trouble. It is not strong enough to hold up the iron, and it would take a great deal more than coke. You would have to use a very mild blast and would blow a large quantity of ignited charcoal out of the top of the cupola, which would be likely to set your building on fire. From your question you seem able to get coke, but would like to leave your money at home if charcoal would be as good. Don't try it. Coke is the best fire for melting iron.

ALUMINUM MIXED WITH CAST IRON.

Question.—Do you advise the use of aluminum in cast iron, what per cent for thin work say one-quarter to one-half, and does it add to the strength and toughness? We are going to cast some gasoline engine cylinders and want a good, strong casting. The thickness of the casting varies from one-quarter to one inch.

Answer.—I would not advise the use of aluminum in your case. In the first case it is expensive and silicon is as good. The action of each material is the same, although it is necessary to use only one-third as much aluminum as of silicon to produce a certain effect. You can purchase silicon at nearly the price of pig iron by purchasing pig iron that contains a little more than the ordinary amount.

An increase of silicon will produce sound, smooth castings. If you use too much you may find that the thicker portions of your casting will be spongy, in which case you must use more scrap. Somehow it has been imagined that aluminum was a strong metal and that it imparted its own strength to iron to which it was added, but this is not the case. When aluminum is added to iron that is too hard it will soften it by changing combined carbon into graphite. If the iron was brittle it would take out the brittleness, but silicon will do the same.

Don't forget that strength is due to the kind of grain the iron has, and by varying the mixture of irons you can find a mixture that will be stronger. Then for softness increase the irons that contain the most silicon.

Among the Foundries.

George Greasby, Jr., has started a foundry in Oskaloosa, Iowa.

A machine shop and foundry is being built at Woodlawn, Ala., by Berry & Co.

B. B. Noyes & Co., of Greenfield, Mass., are building an addition to their foundry.

John J. Markley contemplates the establishment of a foundry at Luverne, Minn.

A brass foundry has been added to the plant of the Conneaut (Ohio) Iron Foundry.

A foundry will be added to the Crellin & Lovell structural steel plant at Des Moines, Iowa.

The Cedar Rapids (Ia.), Pump Co. will enter the foundry business to supply its own needs.

The Magnus Metal Co. has purchased the plant of the Stiles Metal Co., at New Haven, Conn.

J. T. Carmody, of Cedar Rapids, Iowa, will erect a new foundry to meet his increased business.

The J. H. Wagner Co. has been incorporated at Vernon, Ind., to conduct a general foundry business.

Snyder & Baker, of Belleville, Ill., will

erect additional buildings to be used as warehouse and power plant.

Frank Grushour, of Kokomo, Ind., has completed the organization of a company for the manufacture of brass castings.

Robinson & Swain have recently purchased the Live Oak (Florida) Foundry, and are making extensive improvements.

The Kratz foundry at Evansville, Ind., which has been closed since the death of Mr. Kratz, has been purchased by Geo. L. Mesker.

The Hunter Machine Co., of North Adams, Mass., are having plans prepared for a new foundry which will be erected early in the present year.

J. K. Wilder & Sons, of Monroe, Mich., have started the foundry attached to their establishment. It has been idle for nearly fifteen years.

The works of Schaeffer, Merkel & Co., at Fleetwood, Pa., have been sold at assignee's sale to Herman F. L. Rummel, of Reading, Pa., for $22,000.

F. W. Tilden, formerly of Merriam & Tilden, of Greenfield, Mass., has organized a new company which will enter the foundry business at Hinsdale, N. H.

The Maywood Foundry & Machine Co., of Maywood, Ill., has been incorporated with a capital stock of $50,000 by F. E. Lonas, I. L. McCord and O. H. Davidson.

The plant of the Anniston (Ala.) Locomotive and Machine Works, which burned a short time ago will be rebuilt at once. The new foundry will be 60x140 feet.

The Inland Foundry Company has been incorporated at Chicago with a capital stock of $25,000 by John H. Olmes, Charles B. Haffenberg and Eugene Smith.

The Whiting & Rosenberger Co. is a new company doing business at Aberdeen, Md. The officers are: A. P. Rosenberger, Pres., E. S. Whiting, Treas.; F. E. Jones, Sec.; W. L. Whiting, Supt.

The Covington (Ky.) Foundry Company has filed incorporation articles in the office of the secretary of state. It has $10,000 capital stock, and Benjamin Sebastian is the chief incorporator.

The Hancock (Md.), Foundry and Machine Works has been sold by the estate of the late George W. Seylar to William H. Dodson, who had been associated for several years in business with Mr. Seylar.

A new company has been organized in Plainville to carry on the manufacture of iron and brass casters. W. L. Cowles, George D. Clark and Dwight Clark are equally interested in the venture, and the capital stock will be $25,000.

The partnership conducted under the name of Watson, Frye & Co., at Bath, Me., has been dissolved, Mr. Watson retiring, and hereafter the business will be conducted by the other two partners, Scott Frye and John Shea, under the old firm name.

A new foundry and machine company has been organized at Weatherly, Pa. Nearly or quite all the stock, which is to be $15,000, has been taken. At the meeting held recently, Fred. Bertolette, Esq., of Mauch Chunk, was elected president; William H. Koons, vice-president; James F. Kressley, secretary, and Elmer Warner, treasurer.

Improvements are now under way at the plant of the Milwaukee (Wis.) Harvester works. H. W. Conger, first vice-president of that company, says about $175,000 is being spent upon additions to the manufacturing departments and foundry, and that about 300 additional men will be given employment as soon as these are completed.

The Chicago Hardware Mfg. Co., at North Chicago, Ill., has for the past few years purchased its castings and let its own foundry remain closed. Owing to increased business the company will again start its foundry and manufacture castings for its own use, which have heretofore been made by the Chicago Hardware Foundry Co.

The firm of Anderson company, proprietors of the Moorhead foundry, at Moorhead, Minn., has dissolved partnership, the action taking effect at the first of this year, and by which August G. Anderson becomes sole proprietor. The business will be carried on as before under the firm name of August G. Anderson. The Anderson company also owns and operates a foundry and iron works at Little Falls, Minn., but this the dissolution does not affect, and it will continue under the old name.

It is rumored that the cotton gin manufacturers will consolidate their interests under the name of the Continental Gin Co. Among the plants mentioned are those of the Worthington-Munger-Pratt Gin Co., of Birmingham, Ala.; Smith Sons Gin & Mach. Co., Avondale, Pa.; Daniel Pratt Gin & Mach. Co., Prattville, Ala.; Winship Mach. & Foun-

dry Co., Atlanta, Ga.; Munger Improved Cotton Machine Co., Dallas, Texas, and the Eagle Cotton Gin Co., of Bridgewater, Mass. The headquarters, it is expected, will be in Birmingham, Ala. The new organization will not be a pool, but the several companies will sell outright to the new concern, which will be operated as one corporation.

The Braddock Machine and Manufacturing Company, recently organized by Mr. Harry Stanyon and others, for the purpose of manufacturing a line of machine tools, air compressors, etc., has awarded several contracts for the erection of its new plant at Braddock, Pa. The building will be constructed by the Pittsburg Bridge Company, and will consist of a main building, 60x300 feet, a second shop, 80x200 feet, and the third, 30x200 feet. The contract for the traveling cranes has been given to the Monongahela Machine Tool Company, of this city, for one 20-ton and two 15-ton three-motor cranes, to be built by the Northern Engineering Company, Detroit, Mich., which will also furnish, through the Monongahela company, six large ladles. A 10-ton hand power crane will be furnished by the Reading Crane and Hoist Works, Reading, Pa. The Whiting Foundry Equipment Company, Harvey, Ill., will furnish a large cupola and five ladles. The power for operating the company's new works will be generated by gas engines and all machinery will be driven by electricity. The contract for the machine tool equipment has been given to the Monongahela Machine Tool Company. It is the intention of the Braddock company to manufacture a general line of pulley blocks, hangers, compression couplings, etc., together with a compound air compressor, the design of Mr. Slick, chief draftsman for the Carnegie Steel Company.

Fires.

Godfrey & Gilbert's foundry at Ithaca, N. Y. Slight damage to building and patterns.

The Galena (Kas.) Iron Works, operated by Rauch & Kennedy, was totally destroyed by fire Jan. 8.

John Ramsay's foundry, Ohio and Kingsbury streets, Chicago, suffered a small damage in a recent blaze.

The Knoxville (Tenn.) Foundry and Machine Co. was damaged to the extent of $2,000 by fire Jan. 2.

E. E. Brown & Co.'s sash weight foundry at Philadelphia, was damaged to the extent of $5,000 by a recent fire.

Jones, of Binghamton, N. Y., the well known scale manufacturer, sustained a severe loss in the burning of his plant.

The foundry of the Sergeant Mfg. Co., at Greensboro, N. C., was entirely destroyed together with a great number of patterns.

The Georgia Iron Works, of Augusta, Ga., were burned. Loss, $175,000; insurance, $95,000. Many valuable patterns were lost.

The building occupied by James Graham & Co., brass founders, at New Haven, Conn., was badly damaged by a recent conflagration.

A. L. Streeter's foundry at Fortieth street and Wentworth avenue, Chicago, was damaged to the amount of $4,000 by a fire Jan. 8.

The foundry, pattern house and office of the Portage Lake Foundry and Machine Co., at Hancock, Mich., burned Jan. 11. Loss covered by insurance.

The foundry of the Miller Iron Co., at Providence, R. I., was recently visited by fire, inflicting damage approximating $2,500 on building and patterns.

The foundry and machine shop of F. S. Bassett & Co., at Woburn, Mass., was totally destroyed entailing a loss estimated at $23,000. Insurance, $18,000.

Heating and Ventilating Plant in the McCormick Harvesting Machine Company's Foundry.

BY J. I. LYLE, M. E.

The great business depression commonly called "the hard times" through which this country lately passed had its good as well as bad side. Profits were reduced to the very lowest, on generally a very small amount of business, and to make it possible for a great many firms to operate at all the greatest economy in all lines had to be studied and practiced. Now that the country is enjoying prosperity in its manufacturing circles, a great many of these economic laws are being put into operation. Large tools are taking the place of small ones, shops are being equipped with large traveling cranes and better facilities for handling work. Machines are being arranged so that the work is moved as little as possible. In fact, every detail that tends to reduce the cost of output is being installed.

One item, that is receiving at present a

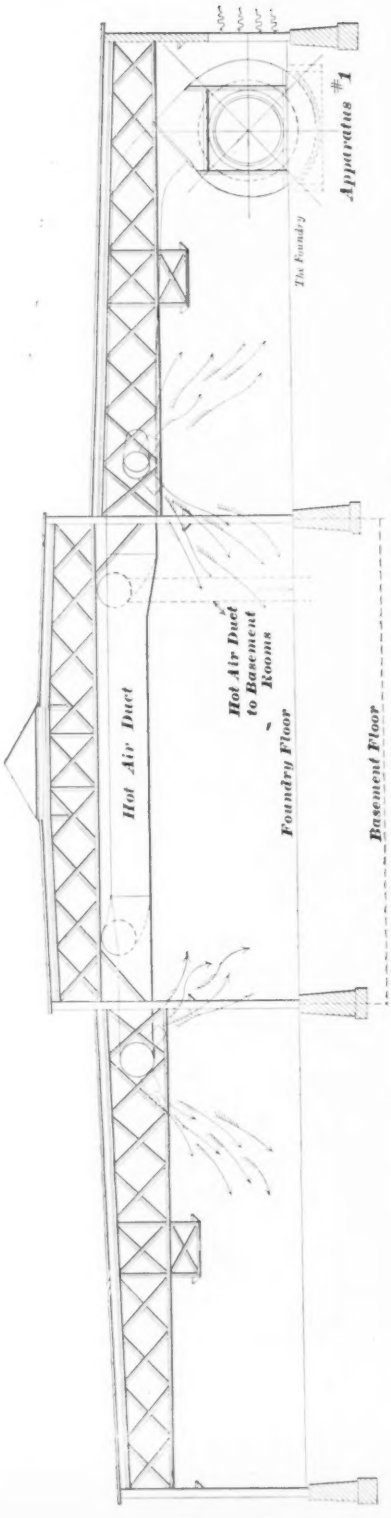
large amount of attention by those in charge of shops is the comfort of the workmen; electric light plants are being installed and improvement of their environments generally are being made, but none are receiving more attention at present than the subject of heating and ventilating. This attention is caused by the same mercenary spirit that has brought about the large percentage of improvements in other lines, and although the effect is humane it is also economic.

The question of to-day is not "whether the factory will be heated and ventilated," but rather which is the most economical and thorough method of performing this work, so the workmen will have pure air free from dust, obnoxious odors, and foul gases to breathe, and the temperature kept between 60 to 65 degrees. In combining these two, heating and ventilating, which is so necessary to obtain even a fair efficiency of either, there is really no competitor in the field with the fan system of heating. In fact, ventilation is solely obtained with any degree of accuracy and positiveness when some form of fan is used. Heating and ventilation at the same time are procured only when the fan is used to distribute heated air through the different parts of the building.

The fan system of heating is especially suited for foundries, as the heat is evenly distributed through the building instead of having high temperatures concentrated along the walls, where direct steam radiation is employed, or in a few places over the floor where that ancient crude method of heating by stoves is used.

Air is one of the poorest of conductors of heat when not forced to circulate, and with either of the latter two methods the hot air quickly rises and passes through the ventilators that are always present in foundries, thus wasting a great deal of heat, without warming the air a few feet away. Any article is economical or not according to the ratio of its cost to its intrinsic value, so that direct radiation can in no sense be considered economical, as it neither raises the temperature to the desired point throughout the building, ventilates or removes gases.

The McCormick Harvesting Machine Company, of Chicago, have just completed one of the largest and best equipped foundries



HEATING SYSTEM OF THE MCCORMICK HARVESTING MACHINE COMPANY'S FOUNDRY.

in that city, and the heating apparatus installed is a splendid example of up-to-date heating and ventilating engineering. The building, which is of brick and stone, is 900 feet long, 162 feet and 108 feet wide, giving a floor space of 135,000 square feet.

The wheel shop occupies a room 162 feet by about 350 feet in the north end of the building, while the foundry proper is in the central part, with chipping room, core room and power-house on the south end. Of the four cupolas used, two are located about 150 feet from each end, which is convenient for distributing the metal to all parts of the floor. Located in each end of the foundry is the Buffalo Fan System Heating Apparatus, built by the Buffalo Forge Company, Buffalo, N. Y., consisting of fans, engines and heaters, the arrangement of which is such that fresh air can be taken from the outside of the building, passed through the heater into the fan and then forced through the galvanized iron piping to the various parts of the buildings. Arrangement is also made whereby the air from the various parts of the building can be circulated over and over again when considered desirable.

The cubic contents to be heated is 4,096,000 cubic feet, and the apparatus is of sufficient capactiy to heat the entire building to a temperature of 60 degrees in the coldest weather. The galvanized iron hot air piping is run up through the roof trusses, so as not to interfere with the cranes or other machinery. One special feature in connection with the application of the fan system to this building is the arrangement of the dampers in the main hot air duct.

For a certain period of the day, possibly all morning until some time in the early afternoon, "when they start to pour off," in the foundry, the entire building will be heated by the fan system, but during the afternoon, heat from this source will not be required in the foundry, so the dampers in the main ducts referred to will be closed to shut the hot air off from it.

It will readily be seen that by shutting off the warm air supply to the foundry proper, that the greater amount will be forced into both ends of the building—that is, the wheel shop, milling room and chipping room. This surplus of air delivered into the ends of the building, as outlined, will necessarily find its way through the windows and doors into the main foundry, and will escape through ventilators provided for the purpose in the roof. The objectional feature of having the steam and gases (which arise during the process of "pouring off") entering the wheel shop at one end, and also the chipping room at the other end of the foundry, is overcome by delivering the large volumes of air into both of these rooms, thereby causing a slight pressure. The surplus of air discharged into these rooms finds its way into the foundry from both ends and gradually discharges the steam-laden air through the ventilators in roof.

The fans are of the ¾ housing type; that is, the portion of housing above the floor line is made of heavy steel plate strongly braced, horizontally and vertically, with angle and T irons, while the portion below the floor line is of brick. These fans are 220 inches high by 84 inches wide, and each is capable of handling 125,000 cubic feet of air per minute when running at 125 revolutions per minute.

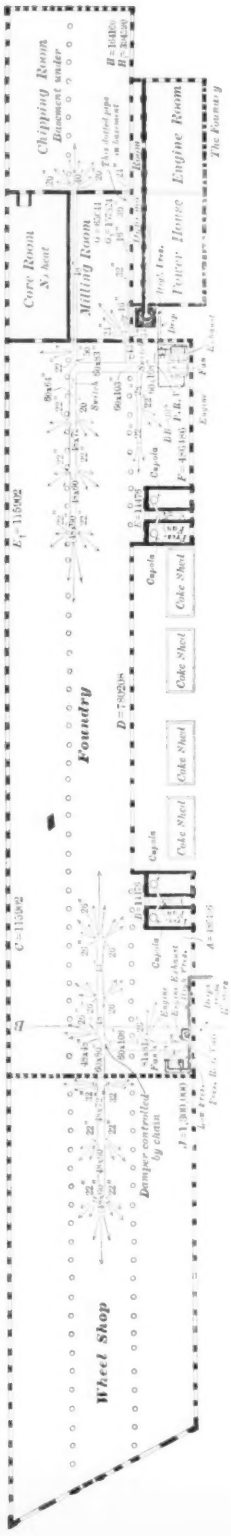
To allow the air to be drawn through the heater at a low velocity, and thus give it ample time to be heated to the required temperature, the heater sections are arranged in three groups as shown in accompanying cut. The air passage through these heaters is much greater than the intake of the fan, thus reducing the velocity through the heaters to less than one-third the velocity at the fan outlet.

Each fan is driven by a Buffalo 12x14 horizontal center crank Class "B" engine directly connected to the blast wheel.

These engines are identical with those furnished by the Buffalo Forge Company for dynamo driving, with the exception that they are not provided with an automatic cut-off governor or enclosed for running in oil. They have forged steel crank shafts and connecting rods, piston valves and adjustable cross heads.

The main bearings as well as the fan bearings are provided with ring oilers, so they need but little attention.

The heater is made up of 60 sections, each consisting of a cast-iron base so divided that steam admitted through one end passes up, over and down the pipes and escapes in form of water of condensation from the lower chamber.



HEATING SYSTEM OF THE MCCORMICK HARVESTING MACHINE COMPANY'S FOUNDRY.

Each section contains two rows of pipes which are staggered, providing a winding passage for the air, thus bringing it in close contact with the pipes and insuring its being heated. Each heater contains over three and one-half miles of one-inch pipe, which is arranged so as to occupy a space of 10x12x19 feet, which is a great saving of space and has the additional advantage of having the piping removed from where it is liable to be injured by the men at work.

The exhaust steam passes through several sections of the heater provided for that purpose, and placed where the cold air enters the heater, thus causing the greatest amount of condensation to take place in them, on account of the wide difference in the temperature of the incoming air and the steam. This large amount of condensation in these sections tends to produce a vacuum instead of a high back pressure for the engine to exhaust against.

The temperature of the air being raised considerable in these exhaust steam sections causes less condensation in the following sections containing live steam, thereby producing a saving of live steam.

Except in drying apparatus, where very high temperatures are required, exhaust steam is nearly as efficient as high pressure steam for heating. The total number of British thermal units contained in steam at 100 lbs. gage pressure is 1,216.5, and at 1 lb. gage pressure is 1,178.4, a difference of 38.1 B. T. U. When the steam is condensed to water at 212 degrees it has practically given up all the heat available for heating the air, so that steam at 100 lbs. pressure contains 1,004.5 B. T. U. that are useful for heating.

At 1 lb. it contains 966.4 British thermal units, or 96 per cent. of the efficiency of the higher pressure.

Where the foregoing is taken into consideration it is readily seen that the cost of driving the fan amounts to practically nothing.

The contract for the heating of this plant was taken by the Chicago office of the Buffalo Forge Company, 22-24 West Randolph street, Chicago, Ill.

Gee Whiz!

Harding Allen's foundry, at Barre, turned out 6,000 pounds of castings in one day last week.—Athol (Mass.) Chronicle.

The Manufacture of Steel Castings.*

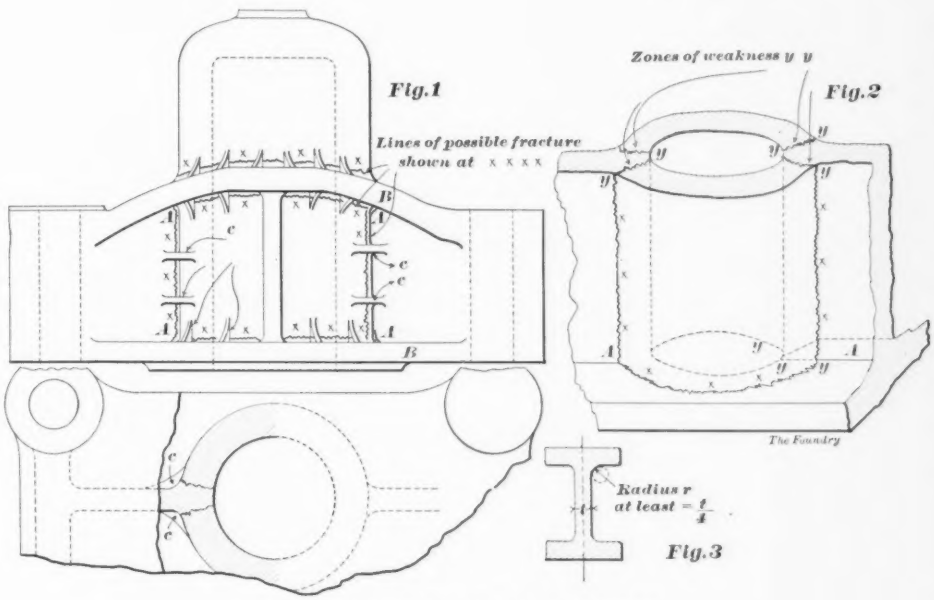
BY J. E. FLETCHER.

Recent researches have revealed most important facts concerning the crystalline structure of steel, and especially have they shown how the laws of cooling affect the structure of this material. The more intricate castings are the most easily affected by the curious heat changes which occur during the cooling and accompanying contraction of the steel.

It is in connection with the contraction of steel castings that I wish to draw your attention, as here lies the chief difficulty in steel casting manufacture. The contractional co-efficient being roughly double that of cast iron (varying from .2 to .25 in. per lineal foot), it will be seen that very special means are necessary in order to release castings of large dimensions rapidly and successfully whilst cooling. It is now not uncommon to be called upon to produce pump rods or stern posts of upwards of 50 ft. in length, or spur rims up to 30 ft. in diameter. It occurred to me, therefore, that a little light thrown on such points as are at present but dimly known by engineers might be of service to them when designing details of steel castings.

I intend to examine briefly the design of characteristic castings used in various departments of machine construction, pointing out where difficulties in manufacture occur, and suggesting how such troubles may be minimized or overcome. Of course, there are failures distinctly due to faulty material, excessive or insufficient annealing, bad molding, etc., but with these I do not purpose to deal, as they are matters which concern the steel founder alone, and inequalities on these scores have small excuse.

Generally speaking, the simpler the cylinder casting is, the better. Ribs and flanges often bring about serious trouble, either by inducing contraction cracks, or points of leakage, when the cylinder is under water pressure.

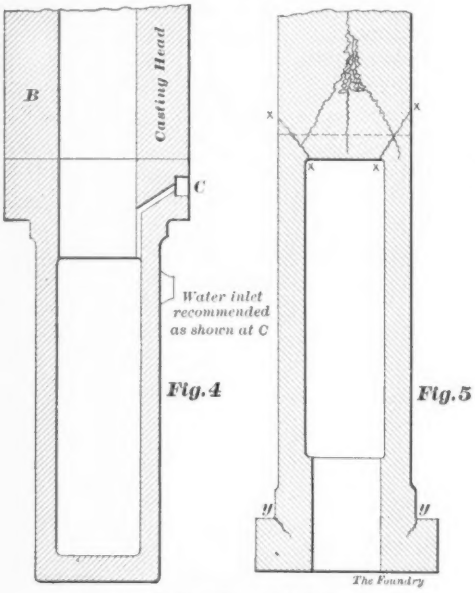


STEEL PRESS HEAD AND CYLINDER.

Fig. 1 shows a cylinder and entablature for a hydraulic press, of a form frequently adopted. These castings tend to draw or contract abnormally at the junction of three planes at points marked A A, and unless very special means are taken the casting may be cracked along the corners X X, especially if the beam flanges B B are very thin relative to the cylinder thickness. The lines of crystallization being normal to the surface of the planes, there is a weak zone

*From a paper read before the Manchester Association of Engineers.

always at the junction of the two surfaces, and which, moreover, is most pronounced at the junction point of the three planes.



STEEL HYDRAULIC CYLINDERS.

Fig. 2 shows the lines along which contractional fracture is liable to occur. In addition to this contractional difficulty the planes of weakness Y Y are the paths by which occluded gases or mold gases appear to escape most easily, for it is along the same lines X X that blow holes are often found, these often communicating with the interior of the cylinder, with resulting leakage when the cylinder is water-tested.

Undoubtedly the best practice is to secure a cylinder of simple form into a separate girder or head, but where this is impossible the following details of design are suggested:

(1) The flanges B B should be as near the cylinder thickness as possible.

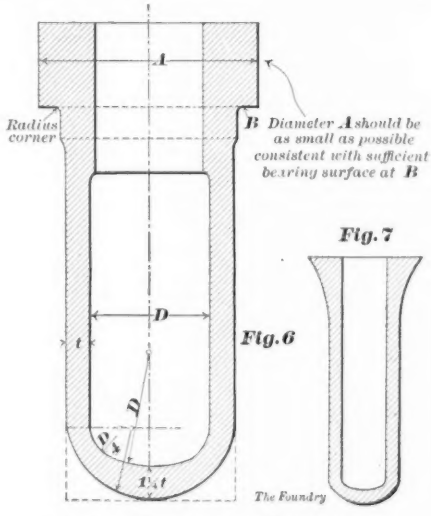
(2) The lines of junction between the flanges and the cylinder should be filled in to a radius of not less than one-fourth the thickness of the web as shown in Fig. 3.

(3) Where advisable, small brackets or angle ribs, of a thickness varying according to the weight of the casting, should be introduced at C C, Fig. 1. These thin brackets, cooling first, promote the early solidification of the steel along the weak lines X X, for it is important to remember that the casting cools slowest along the zones of weakness.

As before stated, the addition of snugs, large water inlet bosses, etc., adds risk to the manufacture of hydraulic cylinders, and diminishes the strength by lending starting points for fracture. A flange or bend, cast round the cylinder barrel, may strengthen the casting circumferentially, but in many cases it certainly weakens it longitudinally.

I am strongly of the opinion that hydraulic cylinders should always be cast mouth upwards for a number of reasons. First, because by this means the weakest portion, namely, the closed end of the cylinder is most likely to be perfectly sound, as it is thus subjected to the pressure of the whole of the cylinder body and casting head above it.

Again, the crystallization of the steel in the cylinder base is regular, not being effected by the gases and shrinkage down the center of the head as is the case with casting shown in Fig. 5. The contraction is also more uniform. The cylinder body and end contract at approximately the same rate, the head B, of course, solidifying last, the accompanying contraction taking place at a slow rate. In the case of a cylinder casting, as shown in Fig. 5, the two ends of the casting are of greatly different mass to that of the intermediate or barrel part, which, cooling first, tends to fracture at the weak zones X and Y.



STEEL HYDRAULIC CYLINDERS.

The examination of failures in various cylinders has led to the adoption of a form approximating to Fig. 6.

Flat-ended cylinders are not recommended for reasons already suggested. Hemis-

pherical ends, though the strongest, do not regularly leave the sand core so well as the form of end shown in Fig. 6. For a perfect cylinder the general form should follow as nearly as possible the lines of the theoretical form shown in Fig. 7.

Hydraulic valve castings often present great difficulties owing to unavoidable uniformity of thickness. The mass of metal at the valve seats often conduces to unsoundness at these points, and this is further intensified by the difficulty of exit of the mold gases. The cores must necessarily be strong and rigid, and consequently are not so porous as is desirable for the speedy exit of the gases during casting. For valves of high pressure, complicated forms are fatal, as owing to the thick walls surrounding cores of comparatively small diameter, these are nipped during contraction to such a degree as to be often, when cool, as hard as the steel itself, and even if such cores can be dressed or fettled out, the surfaces are left so rough as to offer serious frictional resistances to the fluid-flow.

Figs. 8 and 9 indicate how and where leakage troubles due to sponginess occur. Attempts to produce satisfactory castings of high-pressure pump bodies, cast in one piece with the valve boxes, have from similar causes been failures. It is true that such castings are occasionally produced satisfactorily, but there are so many risks involved, that separate valve boxes are desirable. Long hydraulic pipes of small bore have not yet been satisfactorily made in steel, and even if soundness be guaranteed the cost would prevent adoption.

The difficulties attending the casting of hydraulic valve boxes are experienced to some extent in the casting of engine boiler and pipe connections. Of late years boiler manholes, safety valve seatings, stop valve bodies, and similar castings have been made in steel, and their manufacture has been successful except in cases where the desire to eliminate weight has led to contractional flaws and blow holes. Recognizing the fact that high pressure steam is to be the rule in future, steel founders have made every effort to produce the intricate pipe connections between boiler and engine now required. In the navy the introduction of the Belleville boiler has led to the use of steel castings of most intricate form, some of which have been produced successfully, but with others waster after waster has rewarded the founder's efforts.

Figs. 10 and 11 give an idea of the extent to which lightness has been attempted in high pressure boiler work. Such designs are obviously dangerous, and the use of such

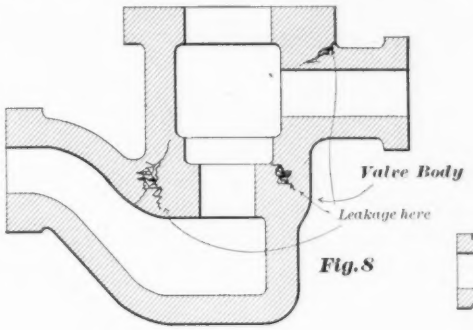


Fig.8

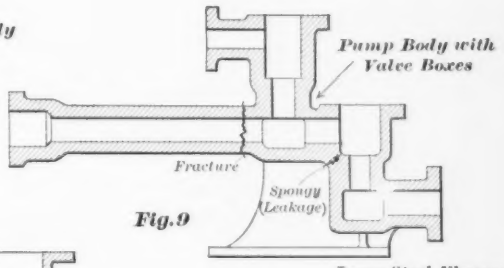


Fig.9

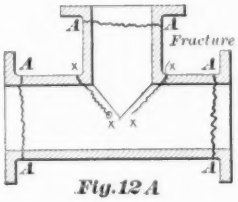


Fig.12 A

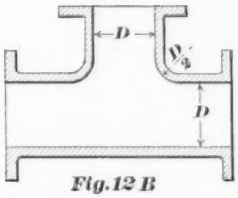


Fig.12 B

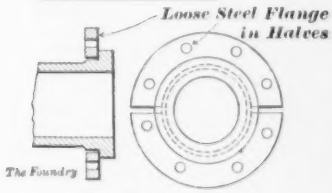


Fig.12

STEEL HYDRAULIC AND STEAM CONNECTIONS.

castings must lead sooner or later to accident. Contraction flaws in such castings are not always visible, and even under the application of water pressure test remain undetected, failure being again and again discovered when the castings are subjected to the steam pressure. It is needless to say that the cost of such castings is very great, and delays due to foundry failures are frequent. I believe I am perfectly correct in stating that on several occasions the completion of warships has been delayed simply on account of the difficulty in obtaining de-

(2) The holes in all flanges should be drilled, small cores are often damaged in casting, and frequently lead to blow holes.

(3) The junction of two bores should be well rounded as shown in Fig. 12b. The form usually employed in cast-iron pipes as shown at Fig. 12a gives trouble by leakage or cracks along the lines X X.

(4) The coupling flanges should be kept as small as possible, as large flanges always tend towards producing cracks shown at A A. Fig. 12 shows a recent plan adopted for high-pressure pipe couplings, and suggested

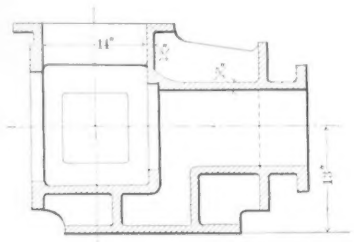
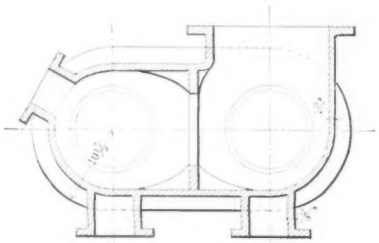
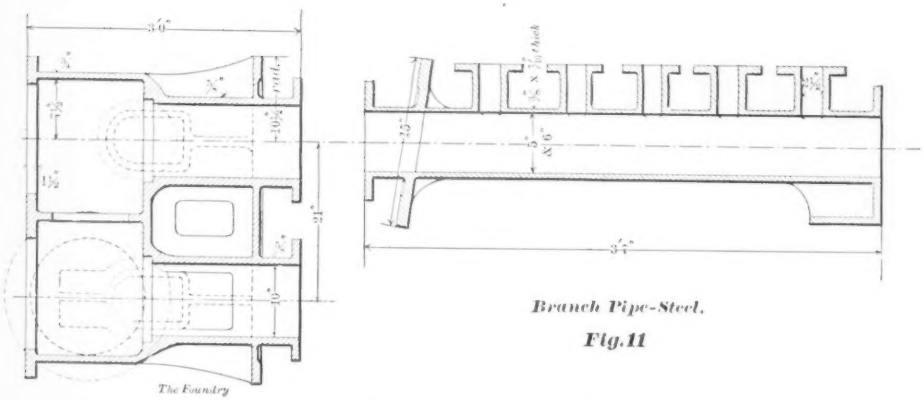


Fig. 10

Double Stop Valve-Steel



Steam Pressure used 250 lbs. per sq. in.



Branch Pipe-Steel.

Fig. 11

EXAMPLES OF INTRICATE STEEL CASTINGS.

livery of steel boiler castings of the intricate order above mentioned.

Attempts, however, to produce such castings have been very suggestive, and from experience gained the following conclusions have been arrived at:

(1) That pipes, tees, bends, and valve bodies of over 4 in. bore should not be less than ⅝ in. thick; under 4 in. bore ½ in. appears to be a safe minimum. 6 in. to 8 in., ¾ in., 8 in. to 10 in. ⅞ in., 10 in. to 12 in., 1 in. Castings of these thicknesses are now in use for boiler pressures of from 150 lb. to 250 lb. per square inch.

by past failures of steel pipes by cracking at the neck of the flanges. Steel steam pipes and bends have given trouble if of lengths exceeding 3 ft. 6 in., the bores of the castings in question being from 4 in. to 8 in.

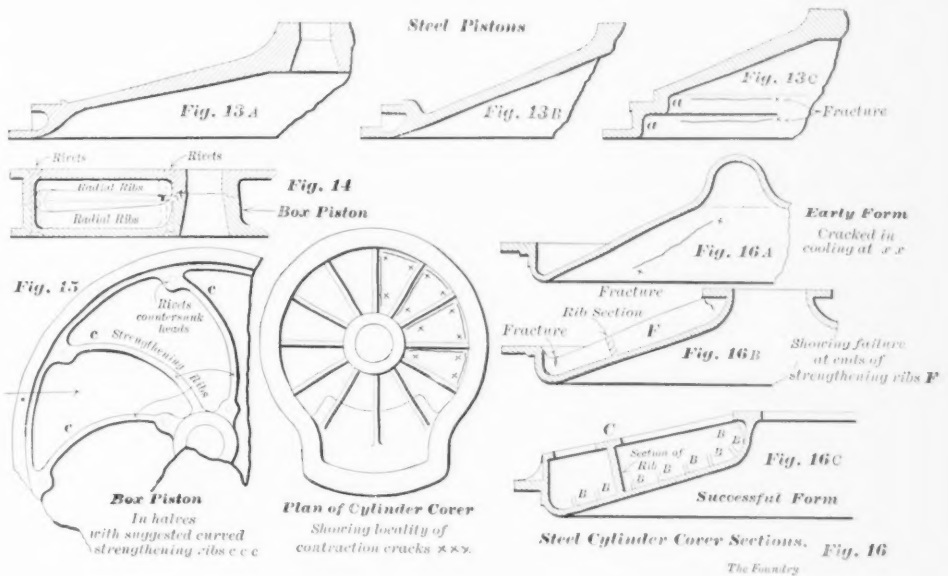
Steel castings for engine details are being very largely used; pistons, crossheads, eccentric straps, and cylinder covers being constantly produced in steel, especially for marine engines. Pistons of conical section are now very successfully produced, but there has been a tendency to avail oneself of the theoretical strength of such a form and thereby reduce the thickness to a mini-

mum. In the marine engine, where this type obtains more generally, one or two failures have resulted from cutting down the thickness. In Fig. 13 three forms are shown. B is the safest in casting, C the most dangerous, especially where the angles a a are left sharp. Fracture in cooling occasionally occurs in radial lines over the conical surface, this being more likely to occur in pistons of large diameter having very flat conical surfaces. Where extreme lightness is necessary, conical pistons should be cast with a good allowance for machining all over.

Up to the present very few box pistons of the ordinary Lancashire type have been cast in steel, and it is indeed doubtful whether much saving in weight could result, as very thin castings are not sufficiently steam tight. The internal cores in this type of piston are very difficult to fettle out cleanly. The best results have been obtained with the design indicated in Fig. 14, although even here there is a tendency for contraction cracks to develop along the roots of the radial strengthening ribs. I should suggest for pistons of this character the design indicated in Fig. 15. The strengthening ribs being curved instead of radial would prevent the radial cracks which often occur during the cooling of all forms of circular discs.

Cylinder covers of cast steel are largely used in the marine engine, and in the manufacture of these the ingenuity of the founder has been taxed to the utmost. Covers for cylinders up to 120 in. in diameter have been made of thicknesses not much exceeding 1¼ in.

Some of the earlier forms are shown in Fig. 16, and these were first attempted at a thickness of 1 in. Failures were, however, so numerous that 1¼ in. was finally adopted. Here again radial ribs were used for strengthening the conical surfaces, and the fractures which occurred in cooling almost always followed the root of one or more of the radial ribs. To obviate this, small brackets, as shown at B, were introduced at the junction of the rib with the conical surfaces. Occasionally, too, the ribs would be found cracking from their outer edge; this was remedied by making a section of the rib, as shown in Fig. 16c.



Owing to the above mentioned risks, cylinder covers are now specified by many engineers to be rough turned to size on the conical surfaces; a wise procedure as this enables the founder to cast the plate thicker, the steam tightness of such castings being at the same time very much helped, there being less risk of blow holes.

Cylinder liners have also been attempted in steel, but the difficulty in producing such castings perfectly sound has not yet been overcome. The risk is so great that steel

founders are not able to quote a price low enough to tempt engineers to use them.

Engine bed frames and columns for marine engines are regularly made in steel, and are usually of either I or box section. Both forms are difficult to make when the thickness is reduced to the theoretical minimum. Bed frames of I section, ⅞ in. thick and 15 ft. over all, gave trouble through contraction flaws, and even when sound were found to be twisted when released from the mold, requiring a considerable amount of setting afterwards. I have found frames of box or inverted U section give the least trouble in this respect. Engine columns, when now designed for steel, are of the simplest possible form, generally a stiff H section. Frequently the designers are tempted to cast on such columns, brackets, bearings, and bosses for the attachment of various auxiliary fittings, reversing shafts, etc., with the consequence that the castings are often distorted beyond repair.

Castings for locomotive purposes embrace a wide field of design, and several articles have given considerable trouble to the steel founder, notably wheel centers, motion plates, and bogie frame castings of more or less intricate form. The greatest difficulty has been in the production of wheel centres having very heavy balance weights, in many cases the mass of these weights being enormously disproportionate to the remaining portions of the wheel.

It is true that steel founders have overcome the difficulty partially, and such wheels can be cast free from flaw, but it is extremely doubtful whether they are ever free from the severe strains set up during contraction, however well the castings are annealed.

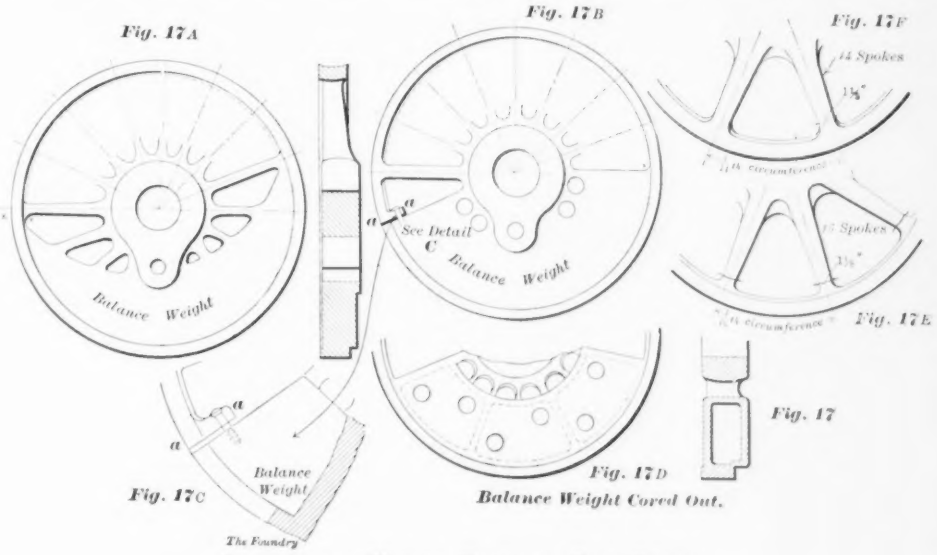
This has been well proved in drop testing, wheels of good material being fractured at the points marked X X in Fig. 17. Wheels of the form B are often worse than those marked A, and several plans have been adopted for overcoming the danger. C shows one method, a portion of the normal rim and arms are thus allowed to contract apart from the massive balance weight, the two portions afterwards being bolted or riveted together at a a. D shows a method pretty generally adopted on the Continent and in America. The balance weight here is cored out, the thickness being fairly uniform with that of the rims and arms. The balancing is afterwards effected by lead or other metal run into the core. Wheel centres having rims very thick in proportion to that of the arms give trouble, it being not uncommon to find wheels cracked through the arms when cooling, as shown in E. A case recently brought before my notice clearly illustrated the effect of the design of arms and rims of wheel centres. In the same furnace charge wheels of types E and F were cast, the diameters being practically the same. Several of the wheels F were cracked at the ends of the spokes, none of the wheels E being affected. A succeeding drop test of the two types showed the wheels E very much stronger than F, the spokes and rims bending considerably before fracture, whilst the spokes of wheels F broke off short, showing that the initial strains set up in contraction were not entirely eliminated by annealing. The fractures were perfectly sound in both cases, and tensile tests taken from the broken wheels gave similar results.

Fig. 18 represents a locomotive motion plate, the office of such a casting being that of a stay between the frame plates and a guide for valve spindles, in addition to carrying the ends of the slide bars. Where the slide valve spindle bosses A are of much thicker section than the remainder of the plate, contraction cracks are often found at the root of this boss as shown in dotted lines. The lugs Y Y to which slide bar ends are bolted, are occasionally pulled off or found cracked at the root from the same cause. The strain set up by the heavy slide valve spindle boss is also responsible for cracks across the centre of the plate. These difficulties have been overcome by the addition of a web joining the slide bar lugs or bosses together, and by the use of separate valve spindle bosses cast on to the steel motion plate. These motion plate castings are scarcely ever lifted from the mold after cooling in a perfect state, being generally found twisted to a greater or lesser extent, the amount of twisting being much increased when the slide valve spindle bosses are not in the centre of the casting. It need hardly be said that the greatest care is necessary in setting these to shape afterwards.

Bogie frame castings of the form shown in Fig. 19 often give trouble. When cooling, the end flanges take the deformed shape shown in dotted lines b d. Various methods

have been adopted to overcome this difficulty, such as casing bars a a across the ends as shown, or by making the pattern initially with the end flanges curved in the opposite way to that in which the deformation takes place. The latter plan has been the most successful.

An interesting fact bearing upon the questions of thick and thin portions in the same casting is found in propeller blades, which in cooling curl from the tip end towards the root of the blade, the pitch being increased considerably at the tip end. In a number of blades, 8 ft. long, made from a pattern having a true helical pitch of 17 ft., the castings, when cool, were found to measure 17 ft. 11 in. pitch at the tip. Other blades



LOCOMOTIVE WHEEL CENTRES, CAST STEEL.

10 ft. 6 in. long and 19 ft. 6 in. pitch were found to increase in pitch at the outer circumference by 1 ft. 3 in. This irregularity has been practically overcome by making the pattern or sweeping races proportionately smaller in the pitch at the tip, the inner section near the boss being maintained a true pitch.

Spur and bevel gearing of large diameter have given a good deal of trouble to both founders and users. Large spur rims of comparatively small pitch, if not circular, are very unsatisfactory; hence the rapidly-increasing use of steel rims with machine-cut teeth. To allow for the irregularity of the pitch diameter, excessive clearance in the teeth is necessary, accompanying the adoption of a long tooth, a most undesirable detail. Most careful design is necessary to ensure steel rims being circular in shape and free from contraction flaws. In Fig. 19, the section a a (detail B), on account of the disposition of the crystalline structure, is not safe to depend on as transmitting any of the load. This should be taken by the side webs B, and, if the wheel be wide on the face, brackets I I may be added with advantage. The arm-web then takes a portion of the load.

In wheels having thickness of flange P, large in proportion to rim, or where heavy bolt bosses have been cast, lack of circularity has been noticeable, and visible evidences of severe contraction have appeared at x x (detail C). The same often occurs with wheels cast with joggles (detail D), for the reception of arms. It is not an uncommon thing to find these designed with a very thick section T between the joggles. The best result is obtained by coring out, as shown in detail E. Joggles should also approach in thickness to the remainder of the section, strength being obtained by deepening the outer rib. Excessively thick joggles are often spongy at the roots.

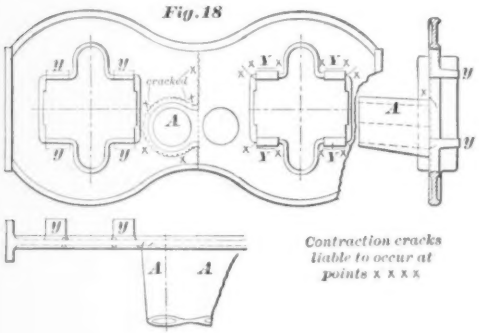
Again, in rims made in segments kidney hoops are often used for holding together the segments when built up. Theoretically these need only be of small dimensions, but as the risers or casting heads are necessary at the points where the hoop bosses occur, the size

of these feeding heads is restricted by the size of the kidney bosses. These, therefore, should be as large as possible.

Rims having a deep or wide face of tooth are often larger in diameter at the bottom side than at the top, this, no doubt, being due to the fact that in releasing the wheel after casting the upper surface has cooled first, thus preventing free contraction of the lower face. This is usually overcome by setting the molding block at an angle with the vertical. The amount of this "coning" action, however, varies with the width of face, general proportions of rim section, and with the temperature at which the wheel is cast. With large rims it is seldom entirely obviated.

The following are the conclusions drawn from the examinations of steel spur and bevel wheels:—

Fig. 18



(1) The thickness of arms and rims should be as nearly as possible uniform.

(2) H section arms are best for steel, neither the X or elliptical sections being satisfactory.

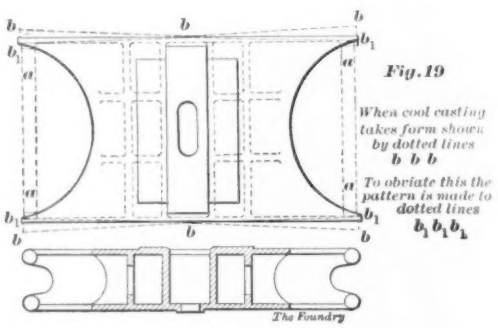
(3) As the weakest point in the rim is almost invariably opposite the arm end, it is advisable to core out the steel at the end of the arm web, as shown in Fig. 20, leaving the side flanges to transmit the power. If the wheel is of wide face, the addition of a bracket of the same thickness as the arm will greatly strengthen the wheel. This is shown at a.

(4) It is not unusual to find fracture occurring at the radius of the arm end, next the rim, on the points marked c c. The radius R should, therefore, be as large as possible. A good plan is to strengthen this weak spot by casting a bead around the curve on the inner side of the web, as shown at b b.

(5) Wheels over 4 ft. 6 in. diameter should have their shaft bosses or eyes split, and afterwards hooped.

(6) The continental plan of adopting an odd number of arms is recommended, such wheels being, as a rule, more truly circular than wheels having an even number of arms. The diameter across the arms of large wheels of light section is always less than that between the arms. In a number of wheels 8 ft. diameter, 2 in. pitch, with eight arms, the diameter across the arms was ⅜ in. to 7-16 in. smaller than that between the arms. This deformation is evidently the result of direct contraction in a line across two opposite arms, and must obviously be diminished in extent by the adoption of an odd number, as illustrated in Figs. 20B and 20C.

(7) Wheels in halves, if of large diameter, give trouble from the same cause, the cast-


b
b1
a
c
Fig. 19
When cool casting takes form shown by dotted lines b b b
To obviate this the pattern is made to dotted lines b1 b1 b1
The Foundry

ings cooling in such a manner that the diameter across the split arm is incorrect. By adopting six arms to the wheel and splitting the boss at a in Fig. 20D, any inaccuracy in diameter may be corrected by setting, the rim being carefully heated along the portion marked x x x x, and the two halves drawn together, or forced apart, by pinching chains or other means, across the diameter B. Recently a wheel about 11 ft. 6 in. pitch diameter was found to be ¾ in. oval, but was easily pulled to its proper diameter by the above mentioned means. Wheels in halves should be cast in one piece, afterwards being sawn or drilled apart at the rim; two halves cast at separate times are not likely to be of the same hardness, nor of exactly the same dimensions.

(8) The arms of bevel wheels should be of H section, and in bevel wheels having very flat faces, i. e., large wheels gearing with

very small pinions, the rims should be stiffened as shown in Fig. 20E, otherwise the pitch circle may not be in a true plane.

(9) Steel wheels with disc centres are not recommended, fracture in cooling being of constant occurrence.

In conclusion, it will, I think, be seen that throughout our considerations of various representative castings, the question of crystalline structure plays a most important part. In fact, wherever in a casting weak zones of crystallization occur there is a risk, to a greater or less extent, of fracture. This risk may be minimized by annealing only, and I am strongly of the opinion that all steel castings should be well annealed.

sition in this respect, and applied themselves to the task of gaining knowledge respecting metallurgy, heat, and machine design, such knowledge, by the way, being now so close at hand.

With intelligent molding, suitable steel, and a grasp of the laws of cooling and crystallization when dealing with the releasing and annealing of castings, steel machine details, if carefully designed, will be perfectly produced in the future. I lay stress on the words carefully designed, and trust that my somewhat disconnected remarks will lead to a closer consideration of the laws which govern the cast forms of metals.

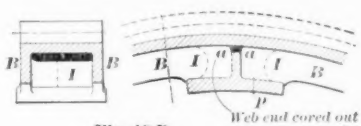


Fig. 19B

Fig. 19C

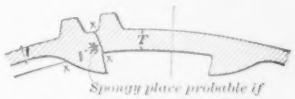


Fig. 19D

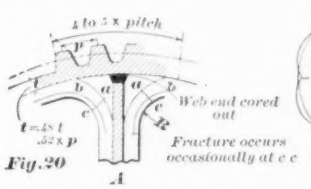
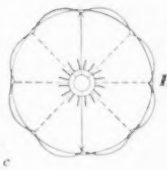


Fig. 20



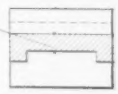
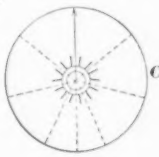


Fig. 19E



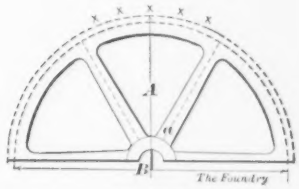


Fig. 20D

Fig. 20E

The demand for very mild steel castings giving high ductility has in some cases been carried too far, intricate forms of rapidly changing section when cast in such mild steel being very likely to fail, indeed it may be taken as certain that the mild qualities of steel develop contraction cracks more readily than the harder ones.

Further researches into this most important subject are certain to occupy attention in the future, and as a result the production of steel castings will be carried on more successfully as the laws of cooling in relation to crystalline structure become more widely known. Steel founders, with all other metal founders, are seriously hampered however by the appalling general ignorance (on scientific subjects) of the molder, who after all plays an important part in casting manufacture. It is high time our molders realized their po-

Use of Emery Wheels.

In the current trade catalogue of Samuel Harris & Co., machinery and supplies, 23-25 South Clinton street, Chicago, appear the following suggestions as to the use of emery wheels:

No wheel of six inches or larger should be run without a wrought-iron guard securely fastened to the frame. This guard should be about ¼-inch thick and not more than two inches from the outer edge of the wheel, and should project one-half inch over each side of the wheel. No matter what make of wheel you use there is a possibility of its breaking while running. A guard need not cost over five dollars; this small sum may save a life; also it may save you as many hundred dollars in damages.

No wheel should be run except on a good

arbor and stand, perfectly balanced, with good collars; always use washers on the side of the wheel a little bit larger than the collars. These should be made of soft paper (blotting) or rubber packing about 1-16 inch thick. Be careful to have the collars screwed up tight. Never force a wheel on the arbor; if too tight, enlarge the hole with an old file until it will go on easily. Be sure and keep the rest close up to the wheel, so the work cannot get caught. Most wheels are run too fast to do good work; 5000 feet at the periphery of the wheel is the highest speed at which any wheel should be run. This will give a 16-inch wheel 1175 revolutions per minute. Many times glazing is caused by running the wheel too fact. Reduce the speed and the wheel will likely cut nicely and last much longer than a softer one.

One cause of wheels breaking while running is having two pulleys on the arbor, and the speed of the large pulley as high as the wheel should be run, then as soon as the proprietor goes away the operator will throw the belt on the fast speed. The next thing is a suit for damages by the operator or his family.

Cause for Alarm.

The fire department was called to Wearne Bros.' iron foundry, 1409 Jackson street, at 6 o'clock last night, but the only things found to be on fire were several tons of molten pig iron, which had caused some person to rush excitedly to the telephone and turn in an alarm.—Omaha (Neb.) News.

The Record of one Foundry.

During 1899 the volume of business transacted by E. N. Cooper & Co. was 40 per cent greater than 1898. One-third more men are now employed than this time last year. The outlook for 1900 is very encouraging. Forty per cent. more money in wages was paid out, the last six months of the year than during the same period in 1898.—Harrisburg (Pa.) Telegraph.

A Big Deal.

The recent boom in the iron industry has rapidly advanced and the owners of old boilers, broken stoves, iron hoops, etc., are reaping quite a harvest. One man in this town recently sold nearly a quarter of a ton of this material to one of the junk dealers.—Boston Record.

Crucible Prices.

To readers of Graphite who are either the users of crucibles or dealers in them, there is little cheerful to tell about prices, in fact the indications point to still higher figures.

The graphite from which they are made comes from the Island of Ceylon, in the East Indies. In the Indian Ocean the monsoons have set in, bringing deluging rains every day. The rains fill the ore-pits and handicap mining, and minimize the output. These rains will not be over till the first of April.

Prices in Ceylon stiffened last week, and advanced several points.—From Dixon's "Graphite."

Chicago Stove Trade.

Chicago has three great stove foundries of her own, writes a correspondent, but the foundries of the whole West and of the whole country are represented in this center, as there is not only an immense home market, demanding every variety, from the cheapest to the very finest of stoves and heating apparatus, but the whole Northwest come here to buy their supplies. As a distributing center no other city in the United States equals Chicago. The manufacturers all cater to the Chicago trade. The volume of traffic here in 1899 was 20 per cent greater than during the preceding year, the aggregate of sales being $25,000,000, a most stupendous figure, when it is known that the stove and heating business of the whole country during the year was but $110,000,000. Prices in the Chicago market, as compared with 1898, show an advance of 40 per cent, most all on the plain, cheaper grades. The increases in the cost of production were caused by the increased cost of iron and of labor, and the marking up of prices, as stated, was confined, for the most part, to the plain styles. The better grades advanced on an average only 10 per cent. The market was very firm at the close, and further advances in the near future were counted among the certainties.—Stove and Hardware Reporter.

Obituary.

Ward Hunt Dean, of the Dean Bros.' Steam Pump Works, died of Bright's disease at Indianapolis, Ind., Jan. 3, aged 50. Mr. Dean had been superintendent of the works since their establishment in Indianapolis.

Received from the Trade.

Henry E. Pridmore has published a pamphlet showing various illustrations of the molding machines manufactured by him, together with a number of views of castings made by same. The whole is accompanied by some statistical information showing just how much the cost of production has been reduced over hand work by the use of the Pridmore molding machine.

* * *

The American Glutrose Works of Philadelphia, manufacturers of the Glutrose core compound, are mailing a nice brochure, dealing with the many qualities of Glutrose, to those interested in coremaking. In summing up their claims for Glutrose the makers say:

One part of Glutrose is equal to one part of oil at about half the cost. One part of Glutrose and one of water is equal to more than three of flour. One part of Glutrose and one of water makes a stronger and more porous core than rosin. One part of Glutrose and one of water is much stronger and better than molasses. One part of Glutrose and ten to fifteen of water is stronger and better than molasses-water. It enables core makers to use many parts of old sand. It is not necessary to vent all cores. It is not necessary to rod all cores. It is not necessary to blacken all cores. It makes the edges and thin places of cores sharp and strong. It prevents castings from blowing, as no gases are generated. It saves half the cost in cleaning cores out of castings. It leaves the core boxes clean. It cannot be wasted and is always ready for use. It makes no offensive smell or smoke. Its price is within the reach of all.

* * *

"Practical Plating and Polishing" is the name of a little book issued by the Zucker, Levett & Loeb Co., of New York. The small size of the book is more than made up for in the amount of practical information it contains. It is such a book as the men who work in the shop will appreciate.

Who Wants Him?

A few months ago we received a letter at this office stating that the writer wanted to correspond with foundrymen's daughters. As we did not feel like assuming the responsibility of being assistants in any matrimonial venture, we did not give the matter the publicity which it possibly may have deserved. Recently a Western foundryman sent us the following communication received by him, and we reproduce it herewith, because we do not want to keep a good man single, or in any other way being abettors in preventing him from meeting his ideal. The letter reads as follows:

Gentlemen—Please pardon me for the liberty I take in writing you. I am 28 years old, 6 feet, weight 165 pounds, brown, curly hair, brown, sparkling eyes, fine appearance, never used intoxicants or tobacco, spotless character. I am a practical molder and melter. I have been a partner for years with my father. He is old, and owns over 200 lots of real state in the heart of this city, and wishes to retire from business and give me the entire plant. I am looking for a foundryman's daughter that can play and sing, and to the right one I will talk business. Have you one? I own real estate, will heir wealth. I would like to move this plant and join my father-in-law in business when the right girl is found. If this epistle strikes you right, please answer. Best of references given.

And Then, their Name goes in the Paper.

The Champion Manufacturing Co., at Rocky Hill, finished unloading a carload of iron yesterday.—(Middletown (Conn.) Tribune.

The use of pneumatic tools and compressed air appliances is so generally recognized as among the best labor-saving inventions of to-day that their use has extended to all branches of manufacture.

The great flexibility of air as a motive power and the ease with which it can be applied to all work, especially in otherwise inaccessible positions, and the facility with which this power is distributed to any desired point, have given it a commanding place among the best labor-saving inventions.

The Chicago Pneumatic Tool Co. report a large increase of their sales with the opening of 1900, their tools going to all parts of the world and into every variety of uses. They are now receiving returns from a general letter to all their customers and the flattering responses show that their tools and appliances have met with the highest and continued favor everywhere.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.
Answers addressed to our care will be forwarded

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

FOR SALE CHEAP—Modern equipped gray iron foundry, located at Albion, Mich.; capacity, fifty molders. Address J. H. HESS, Moline, Ill.

FOR LEASE—Foundry plant, admirably located in Detroit, in excellent repair; capacity two hundred moulders. Write Michigan Malleable Iron Company, Detroit.

FOR SALE—Cupola; 84-inch diameter, hight from bed plate to top of stack 49 ft. 3 inches. For further particulars address Kansas City Car & Foundry Company, Kansas City, Kansas.

FOR SALE—Foundry buildings, engine, etc. Well located on side track in eastern Tennessee town. Great bargain. Write for particulars. Morristown Real Estate Exchange, Morristown, Tenn.

FOR SALE—Second hand. One 63-inch Boston blower, 11-inch outlet, good as new. One 5-ton foundry screw ladle, in good working order. AMERICAN HOIST & DERRICK CO., St. Paul, Minn.

WANTED—Position as assistant foreman in large gray iron shop by an experienced man. Employed at present, but would like a change. Used to hustling. Address "Assistant," box 363, care THE FOUNDRY.

WANTED—Correspondence with party who fully understands the manufacture of malleable iron castings and who is competent to erect annealing furnaces as well. Address "Butler," box 362, care THE FOUNDRY.

WANTED—First-class molder as assistant foreman. None need apply unless capable of making good foreman. To an energetic and capable young man this is a good opportunity. Address "Assistant," box 366, THE FOUNDRY, Detroit, Mich.

WANTED—Foundry foreman capable of taking entire charge of foundry. Must be young man of ability and able to handle men. Shop runs 40 to 50 molders. State experience and wages expected. Address "Boston," Box 367, care THE FOUNDRY.

WE ARE ENLARGING our foundry plant and will shortly require the services of a large number of competent molders. We invite applications from men who are skilled in large work made in green and in dry sand. Apply by letter. THE WESTINGHOUSE MACHINE COMPANY, East Pittsburg, Pa.

WANTED—Foreman to take charge of large foundry making cast iron bath tubs and plumbers'ware. Must be experienced in this line, and have good executive ability. Answer fully, giving references. State age and length of experience. Must be sober, industrious, brainy mechanic. Address "Plumber," box 364, care THE FOUNDRY.

The S. Obermayer Co. of Cincinnati, Ohio, Chicago, Ill., and Larimer, Pa., are beginning the new year by sending to the trade a combined calendar and order blank.

They announce that they are now at work upon a 400-page catalogue, which will be the most comprehensive of its kind when published. It will be ready for distribution about March 1st.

The S. Obermayer Co. announce the following representatives for 1900: Wm. Fitzpatrick, Eastern States; W. J. Adams, Western States; W. A. Henderson, Southern States; Fred J. Brunner, Central States; Jas. E. Evans, Chicago and vicinity; E. J. Woodison, manager Fire Brick Department, Detroit; S. T. Johnston, manager Equipment Department, Chicago.

Brass founders will be interested to know that the Cowles Electric Smelting and Aluminum Co., of Lockport, N. Y., has added to its list of alloys, that of aluminized zinc and is prepared to furnish this alloy in any quantity. Aluminized zinc contains ten per cent. of aluminum and ninety per cent. of zinc and is considered the best metal for adding aluminum to brass. The Cowles Company makes it in small ingots of convenient size and shape for adding to brass mixtures in the crucible. The ingots weigh about one pound each and the alloy is made of the best grade of spelter and of ninety-nine per cent. pure aluminum.

Pig iron production in the United States during the first eleven months of 1899 is estimated at 12,235,000 gross tons, and for the year will probably reach 13,450,000. The production in 1898 was 11,773,934 tons.

Pure East India Plumbago . . .

SILVER LEAD, GRAPHITE.

Guaranteed to be Absolutely Pure and Unadulterated.

Let us send you a Sample Barrel, and if not as represented return to us at our expense.

.. THE ..

S. OBERMAYER CO.

CINCINNATI, O.
CHICAGO, ILLS.

Write for General Catalogue No. 26.

Seal Coal Facing.
Bituminous Facing.

CARLOADS OR LESS — IN BAGS OR BBLS.

Guaranteed to be ground fine and uniform, and go further in use, produce better results than any others.

LET US QUOTE PRICES.

Obermayer's Name is a guarantee they are the BEST!

SPECIAL BRANDS

OBERMAYER'S

Molders' Steel Shovels will outlast any others.

OBERMAYER'S

Galvanized Brass or Steel Riddles.

OBERMAYER'S

Molders' Soft and Hard Brushes.

OBERMAYER'S

Patent Malleable Iron Spout Bellows

OBERMAYER'S

Cupola Blocks and Fire Brick.

FOR Light and Heavy Castings

THAT which is mostly desired, is a bag Facing or Blacking that will not stick to the trowel in slicking, will not wash or run in pouring, peel clean and leave a smooth face casting. A Facing and Blacking that will do this must be composed of materials that will stand the iron, therefore they must be **entirely fire-proof.** They must absorb the moisture, therefore must be finely ground and porous, and to slick well, they must not be too sticky; combined with all these qualities they must peel well from the casting. It has been the work of years to get the proper ingredients when mixed together and pulverized, that would give these results. We sell our Radiant Facing and Blacking with a guarantee that it comes nearer doing this than any other Facing and Blacking ever put on the market. One trial is convincing that all we say about it is right. It is of course understood that to make the Facing do its work, other matters must be well attended to. A good quality of Sea or Stone Coal Facing must be mixed with the sand, and the Facing and Blacking **applied** correctly. Radiant is incomparably the **best, cheapest and most economical** Facing and Blacking in the market. To those who never used it we will say: It is the best because **it can be dusted on a mold and can be slicked or not.** If it is **not slicked** it will **stick, not run, not wash,** and make a dark blue casting. It is economical because it does not require much of it to accomplish good results, and makes a smooth casting, saving labor in cleaning. It can be used with good result on any casting made in the general jobbing foundry, from the lightest stove plate to the heaviest rolls or chunks. It also makes as good a core wash as could be desired. Every foundryman should use it.

IN BARRELS OF 400 POUNDS. 2¼ CENTS PER POUND.

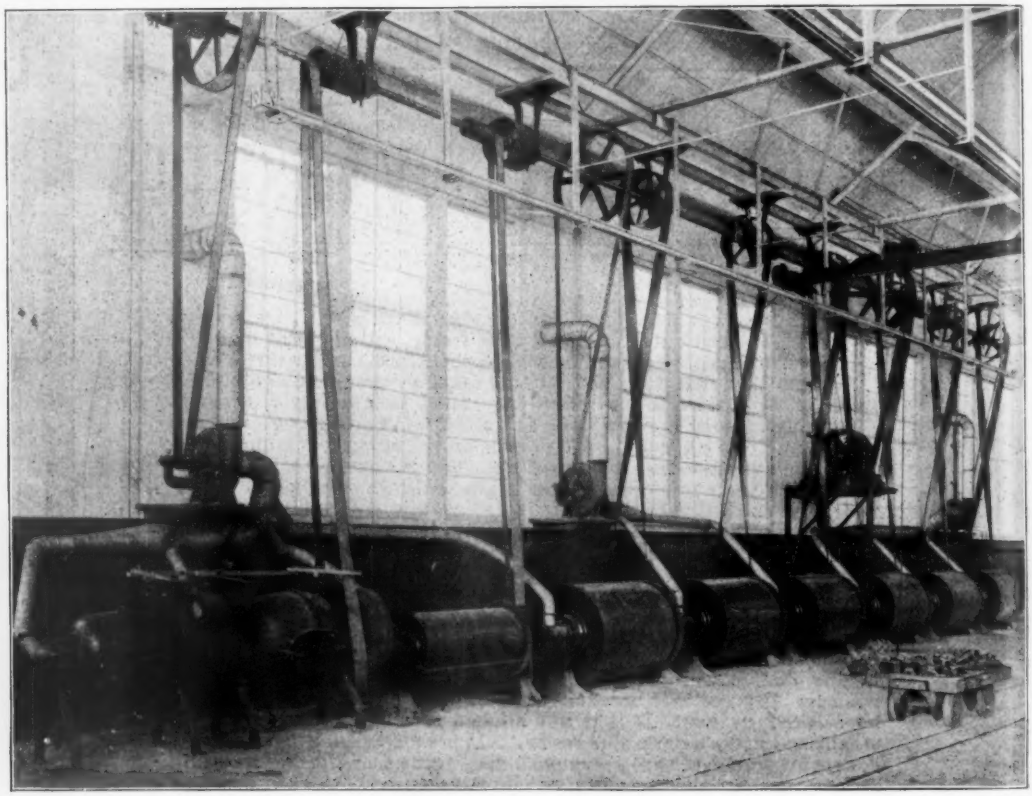
MANUFACTURED ONLY BY

The J. D. Smith Foundry Supply Co

CINCINNATI, OHIO.

Paxson Exhaust Rumblers

MADE OF STEEL.



No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors. We also supplied them with two egg-shaped Rumblers, as shown in the cut.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

LOCATION AND AREA OF TUYERES INSURE THE HIGHEST MELTING . . . EFFICIENCY. . . . . .

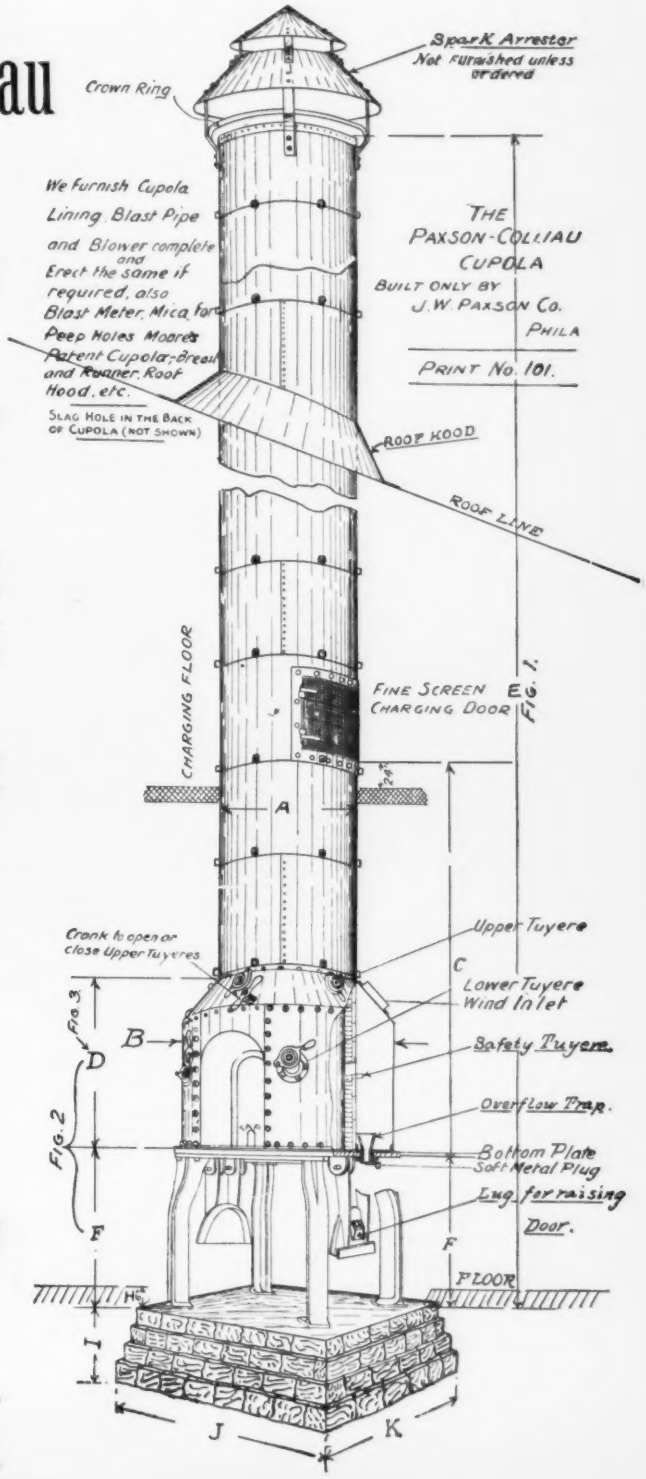
It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

J. W. Paxson Co

1021 . . .
North Delaware Avenue,

PHILADELPHIA, PA., U. S. A.



ALBANY FACING MILL CO'S

FACING PLANT.

MANUFACTURERS OF

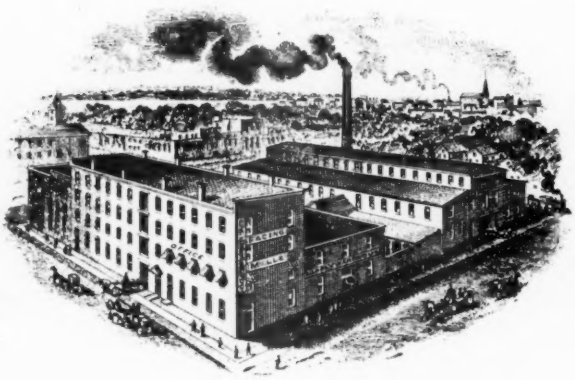
Silver Lead.

German Lead.

Return Facing.

Mineral Facing.

Charcoal Facing.



Foundry Riddles.

Soft Brushes.

Wire Brushes.

Shovels.

STOVE CEMENT.

Stove Plate Facing.
Soapstone Facing.
Sea Coal Facing.

ALBANY FACING MILL CO.

ALBANY, N. Y.

Ask for Prices.....

NEXT WINTER

WHEN your molding sand is in that muddy condition where nobody can use it, when you have to melt extra iron to dry it out, then stop and think of the advice we are giving you now to lay in your winter's supply without delay.

The cost per ton for freight is the same, whether you buy dry sand or mud. By getting the sand in the right condition, as you get it . . . . .

NOW

you save money by getting better and more sand, too. If you want to make mud out of it, add the water after you get it home.

Zanesville Molding Sand is so well known as the A1 sand for all classes of work that a further explanation of its many good points is not needed.

If you want your cupola lining to last indefinitely, use our **Crude Plastic Fire Clay.**

It is the greatest stuff you ever saw for both cupolas and ladles, when mixed with our **Bank Fire Sand.**

Get our quotations on these kinds of materials laid down at your own town, before you forget it.

E. M. AYERS
Market Block
ZANESVILLE, OHIO.

H. S. VROOMAN.
Western Agent,
220 W. 20th Street,
CHICAGO.

THE BEST

Sand

Like Other Things, is the Cheapest.

We've got it. The Price is Reasonable.
The Quality is GUARANTEED . . . .

Our Stove Plate has No Equal.

Brass Sand.
Stove Plate Sand.

Medium Machinery Sand.
Coarse Machinery Sand.

And it's all good and strong—plenty of body. We don't ship the open stuff. Ask your neighbor about our sand, or write one of the Albany foundries—they are right on the ground and know what we've got.

ALBANY AND NORTH RIVER SAND CO.,

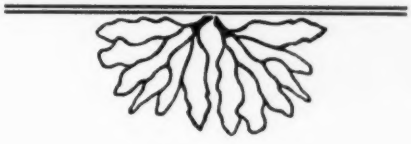
(FORMERLY L. MURRAY & CO.)

80 STATE STREET, ALBANY, N. Y.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

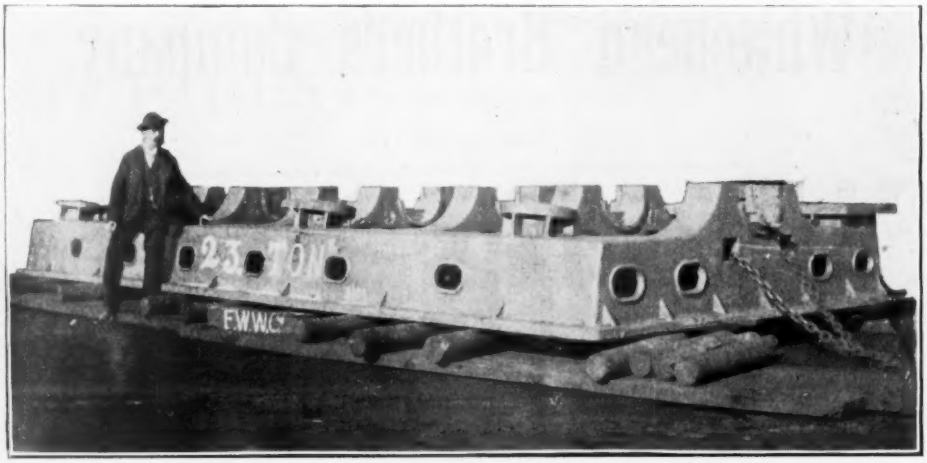
537=39 *West 27th St.,*
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.



BIG WORK

is always produced with greater ease if the **C. F. M. Founders Perfect Wash** is employed in finishing the mold.

It is as perfect as its name indicates. It is perfect whether used wet or dry.

There are cheaper things to put on a mold than the **C. F. M. Founders Perfect Wash.**

There are none so good and none so cheap in the end.

The **Perfection Core Box,** made by us, and nobody else, is a great thing whether you are in a rush or not. You can buy it by the foot and saw it off in such lengths as you want, or you can get it by the box, if that will suit you better.

We have these core boxes in all different diameters. They have no dowel pins to break off or holes to fill with sand. Your coremaker can explain the advantage of this to you.

In **Foundry Supplies** we have always kept in the front row. The very top notch of quality has been our aim.

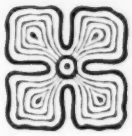
OUR CATALOGUE GOES TO YOU BY REQUEST. DO WE HEAR FROM YOU?

The Cleveland Facing Mill Co.,

FRANK H. CHAMBERLIN, Prop.
CLEVELAND, OHIO.

Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.



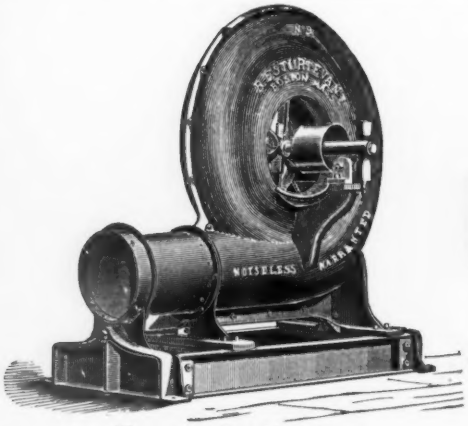
CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

Joseph Dixon Crucible Co.

JERSEY CITY, N. J.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

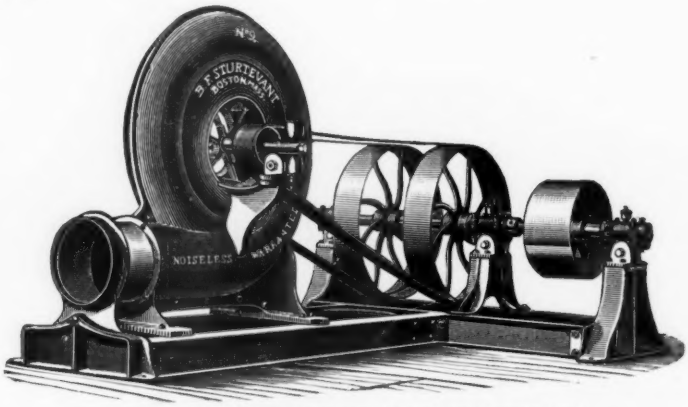
—FOR—

Cupola Furnaces and Forge Fires.

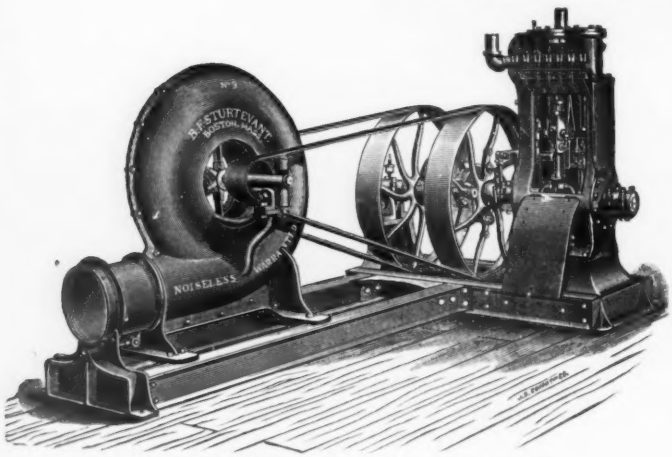
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

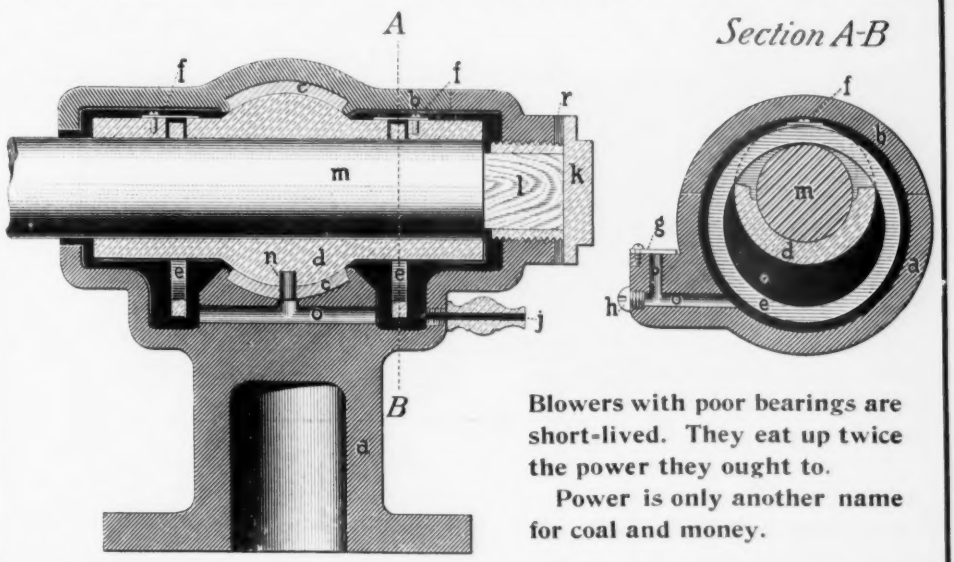
B. F. STURTEVANT CO.,

BOSTON MASS.

131 Liberty Street, NEW YORK, 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

The bearings determine the life of a Blower and also the cost of operating it.



Blowers with poor bearings are short-lived. They eat up twice the power they ought to.

Power is only another name for coal and money.

IN order that foundrymen in general may become better acquainted with our method of constructing bearings for the **Poole Pressure Blower,** we show herewith two views of same.

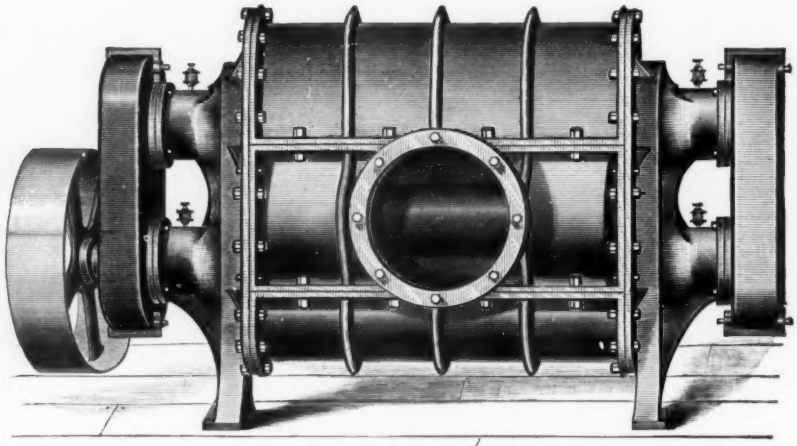
a—Pedestal.
b—Cap.
c—Babbitt.
d—Bronze-sleeve.
e—Brass Oiling Rings.
f—Ring Retainer.
g—Oil-hole Cap.
h—Oil-Hole Plug.
j—Oil Drainage Cock.
k—Bronze Adjusting Nut.
l—Lignum-Vitae Plug.
m—Blower Shaft.
n—Retaining Pin.
o-p—Oil Duct.
r—Adjusting Washers.

With such a construction of bearings, the **Poole Pressure Blower** will, with ordinary care, last indefinitely.

The other parts of the **Poole Pressure Blower** are constructed with equal care. We show this in our regular catalogue, which is yours for a postal card.

Manufactured and Sold by **J. B. & J. M. CORNELL,** 26th St. and 11th Ave. NEW YORK CITY.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: **Frazer & Chalmers, Inc.** CHICAGO, ILL., and BRANCH HOUSES.

M. M. COCHRAN, PRES.
J. R. LAUGHREY, VICE-PRES.

JNO. H. WURTZ, SECY.-TREAS.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal.

5000 Tons Daily Capacity.

300 30-TON COAL CARS

50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

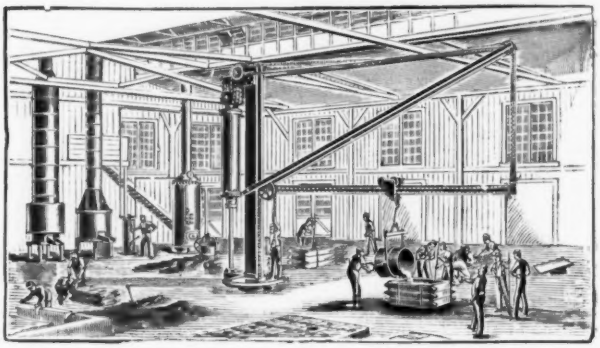
Same Old Anecdote!

Only this time it was the **BUILDERS IRON FOUNDRY** of Providence, R. I., one of the best known shops in New England, who listened to our cry and investigated the Ridgway Crane.

Then they sent for us.

We put on our Sunday clothes and took the little journey to Providence and told them how we would do it if it was our foundry.

They told us to go ahead—we're agoin.'

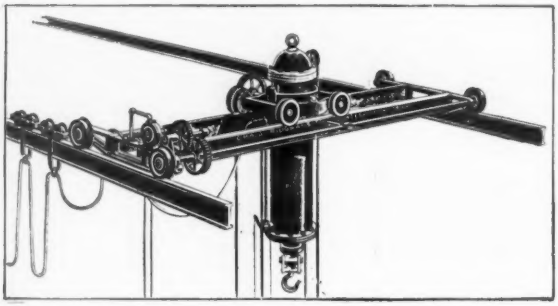


5-Ton Steam Hydraulic Crane in a Foundry.

If you will go there after a while you will see another of the best foundries in the land equipped with Ridgway Cranes — and yet you are one of those who think all these things we say about Ridgway Cranes are simply advertising "gush."

The Builders Foundry have electrical travellers and all up-to-date tools and know what they do when they adopt Ridgway Cranes. If you would only investigate Ridgway Cranes you, too, would have them. And that mighty quick, too!

HYDRAULIC AIR HOISTS



These Air Hoists are the only ones not Air Guns. Air Gun Hoists break men's arms sometimes. Doctor bills and damage suits sometimes. Our Oil Governed Hoist is perfectly safe. Costs more than Air Guns, but cheaper than lawyer and doctor charges.

If you know them you'll want them

"PLEASE TAKE THE ELEVATOR"

DON'T THINK OF ANY OTHER IF WE CAN SUPPLY YOU.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

EUROPEAN AGENT,

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ROOTS'

BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS

BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

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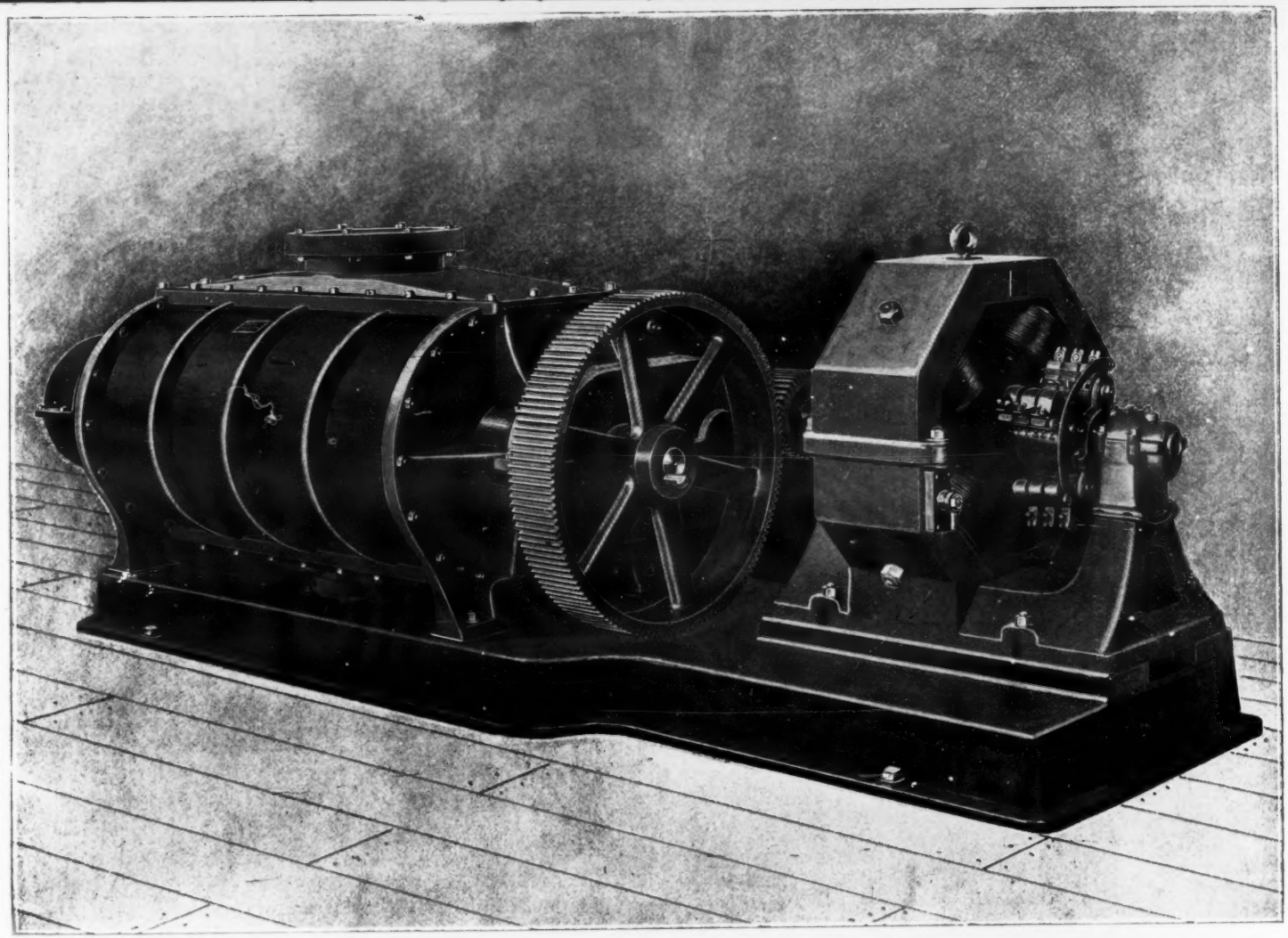

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.

ECONOMICAL.

EXPEDITIOUS.

NOTE. — The old-fashioned method of sifting sand has been to a large degree superseded in modern foundries by the Superior Centrifugal Method, and the machine illustrated herewith is a real labor saver.

Correspondence Is Solicited.

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

Look at this picture

where the iron is carried right to the molders' floor with the help of a simple trolley track.

Then look at your own shop and see how your men are getting their iron. Likely enough they have to get it to their floors by main strength and awkwardness.

You have to pay for all of this. If your men are tired out day after day, they will certainly not do as much, nor as good work, as others who are provided with better facilities.

The Coburn Trolley Track will not only carry iron. It will take in and out of the shop anything that comes along. It will do this quicker and better than human labor.

The Coburn Trolley Track is one of the simplest appliances to install. It costs but little and the service it gives has never been equalled.

When you write us, send along a rough sketch of your shop and state how much iron you handle at a heat. We will give an estimate, as near as we can, of what it will cost to equip your shop with the greatest labor saver of the century —**the Coburn Trolley Track.**

COBURN TROLLEY TRACK MFG. CO., Holyoke, Mass.

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We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

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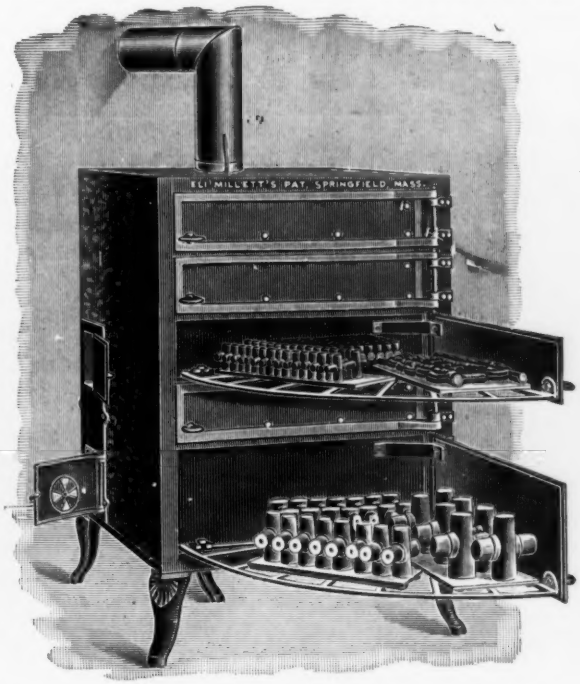


The Millett Core Oven

is such a handy thing around any kind of a foundry that, when once tried, it is never discarded, instead there are orders for more.

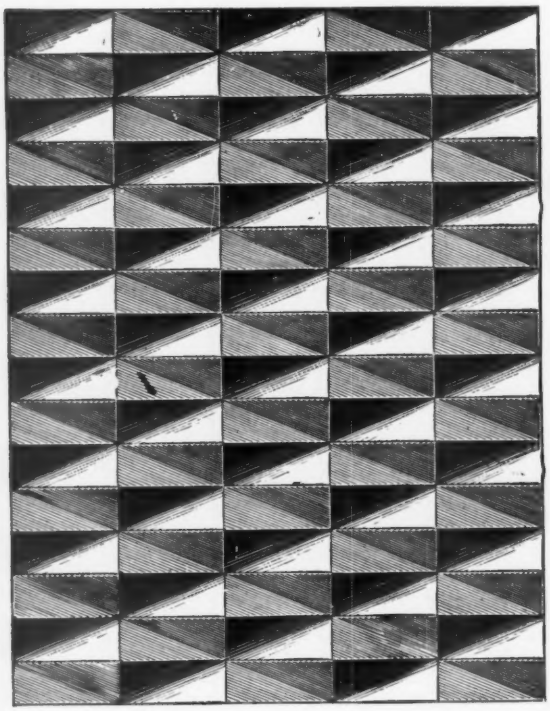
Just think of being able to dry a small core in a few moments, and to do this without disturbing more than the shelf on which the core itself is placed. If you use your home-made oven, you must open the door to the whole oven in order to get a core out. In doing so, the oven is cooled off more or less every time, and the result is that you receive your cores in all kinds of conditions.

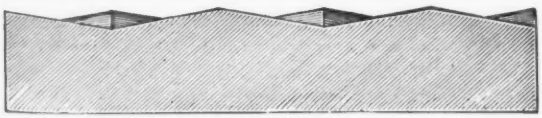
By using the Millett Oven you can have perfect cores and have them just when you want them, too.

The Millett Core Oven is in use all over the world—a testimonial to the fact that it is a good oven and a paying one, besides. A Booklet describing it more in detail will be fired your way upon receipt of your address.

MILLETT CORE OVEN CO., BRIGHTWOOD, MASS.

For Sale by THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.





The above cut shows exact size of Diamonds.

Diamond Pattern Lumber,

—FOR—

DOOR SILLS, PLATFORMS, STEP PLATES, Etc.

This Patent Lumber is made by a Specia Machine invented by us, the ONLY Machine of its kind, and each piece will match PERFECTLY with all other pieces, by "joining" the edges to the centre, lengthwise, or any row of Diamonds.

Size of each piece, 8 feet long by 6 inches wide, and ½ inch thick. Price 10 cents per running foot of 6 inches in width, NET CASH crated and delivered f. o. b. Chicago, in orders of not less than 6 pieces. Send for sample.

BROWN BROS. MFG. CO.

Cor. Clinton and Jackson Sts. Chicago.

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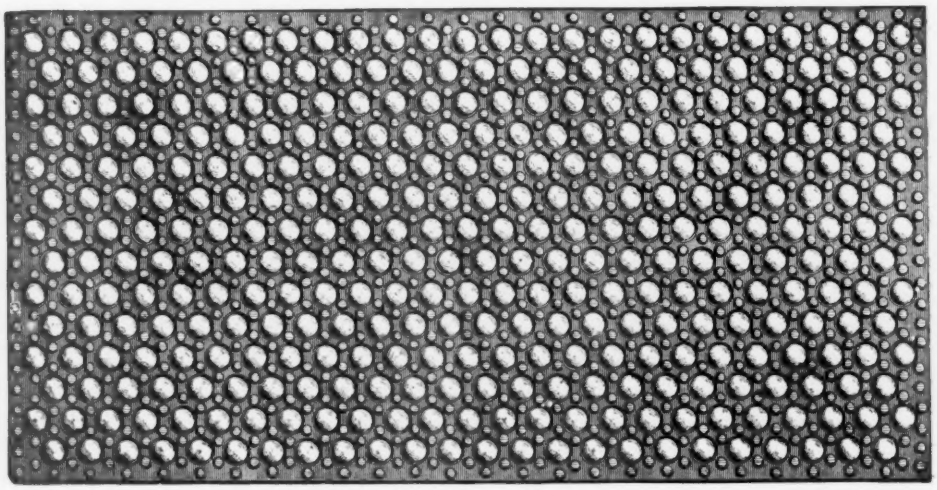

Make your own frames and we will furnish you with Tiles for either Iron or Concrete Lights. Write for prices.

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Over 15,000 in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

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CHATTANOOGA, TENN., May 5, 1896.

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GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y, & Treas.

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THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

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Over Four Years

WE HAVE ADVERTISED **Smooth On** in THE FOUNDRY. Could we have done so, neighbor, if **Smooth On** did not do what we claim for it? You never heard anything about it? That is not our fault, brother. When a foundryman fills up a spongy spot in a casting, worth maybe a hundred dollars, so that you can't tell but what it was a perfect casting from the start, he is not going to ask you to come in and watch the operation, especially if you are bidding against him for work, is he?

No, sir; he's going to let you haul all the castings to the scrap heap that you want to, while he saves his own and makes a profit. Anything is fair in war, and the sooner you secure the same weapons as your competitor, the better it will be for your business.

Smooth On is a weapon that has saved hundreds of foundrymen from coming out of the small end of the horn on a bad contract. Why just think, my son, of saving the majority of castings that have blow holes, shrink holes, or are full of dirt! Ain't this enough in itself to make a respectable profit?

Don't you begin to see now why nobody is talking about **Smooth On?** Just a question of dollars and cents. **Smooth On** puts hundreds of dollars into a foundryman's pocket yearly and he would not be human if he put you onto how it is done.

If foundrymen who use **Smooth On** would tell their neighbors what it has done, there would be no need of us doing any advertising. Its reputation would carry us along. But everyone who uses **Smooth On** tries to keep a corner on it as long as he can, and we cannot be satisfied to reach a few.

A casting cured with **Smooth On** has the same appearance as a perfect casting. It sticks to the casting 'till it is worn out. Nobody needs to know that you are saving your scrap, except yourself. Keep a can of **Smooth On** where it will be handy; you don't know when you may need it.

Smooth On Mfg. Co.,

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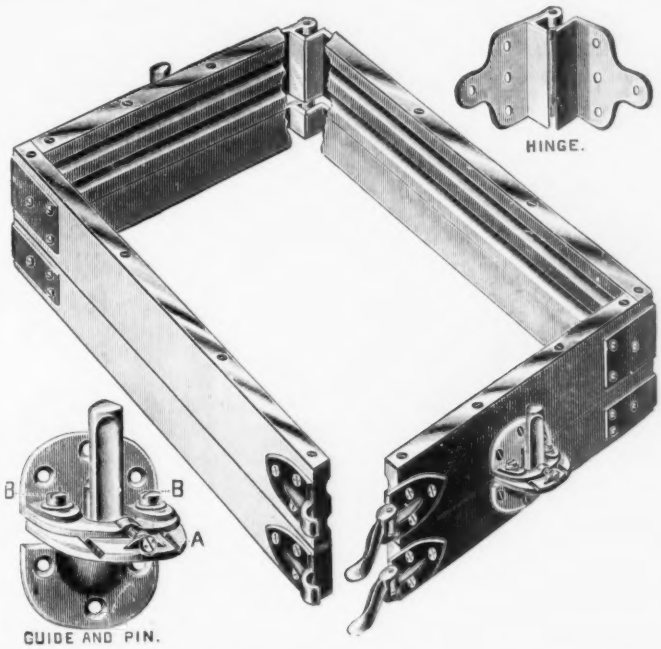
Stearns Improved Snap Flask

Cheaper Than You Can Make Your Own.

The large "V" shaped pins with corresponding bearings insure a level lift of the cope, enabling comparatively inexperienced help to mold difficult patterns.

The inner edges of the malleable iron hinge are beveled, bringing the corners perfectly true. The flasks are made of whitewood—light in weight, yet stiff and strong, edges and corners bound with iron.



These sizes, which are inside measurement, with 2-inch nowel and 3-inch cope, are kept in stock:

No.	Sizes.	No.	Sizes.	No.	Sizes.	No.	Sizes.
1	9x13	8	10x13	15	11x13	22	12x13
2	9x14	9	10x14	16	11x14	23	12x14
3	9x15	10	10x15	17	11x15	24	12x15
4	9x16	11	10x16	18	11x16	25	12x16
5	9x17	12	10x17	19	11x17	26	12x17
6	9x18	13	10x18	20	11x18	27	12x18
7	9x19	14	10x19	21	11x19	28	12x19

PRICE, $2.50 Each. Special Sizes furnished at an advance of **25** cents, net, each.

The metal furnishings, only, will be sold to parties desiring to make up their flasks. **Price, $1.50 per set.**

E. C. STEARNS & COMPANY, Syracuse, N. Y.

Makers of STEARNS BICYCLES and
Manufacturers of Hardware.

WHEN

YOUR CUPOLA bungs up without any apparent cause except pure cussedness, then it . . . comes in mighty handy to have something to refer to, something that will help you in getting on your feet again. When your iron comes cold and then hot, when your cupola melts fast at one time and slow at another, then you will wish you had some good neighbor to help you out.

When your cupola lining doesn't last half as long as the other fellow's, you will wonder what is wrong with your own.

We will furnish you a book that will answer these and a thousand other questions. It will be a neighbor and a friend to you, and the longer you have it, the more you will consult it.

Know your own business. Then you will not have to rely on others. As a help in acquiring the ability to melt iron as it should be melted, you will find EDWARD KIRK'S new work on **"The Cupola Furnace"** to be the greatest thing out.

It tells all about Cupola Practice in a practical way, tells it so you can understand it. The book has 350 pages and 78 illustrations. It will be sent to you for **$3 50.** You have got to get very little information before you have this amount of money back.

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Name_____

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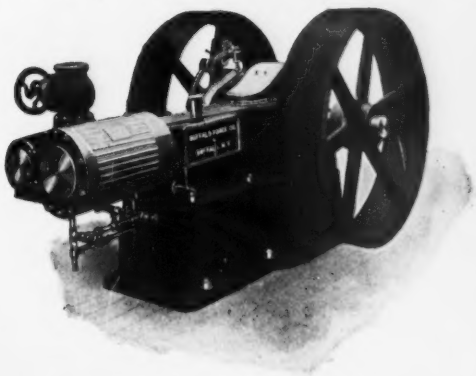

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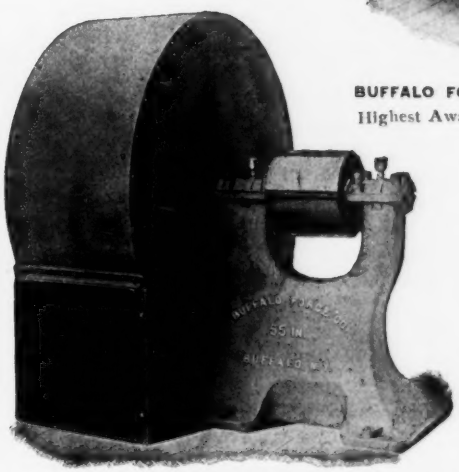
Highest Award and Gold Medal at Omaha, 1898.



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Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

Send for details.

Our 400 Page Catalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

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Buffalo Forge Company,

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BUFFALO CUPOLA BLOWER.

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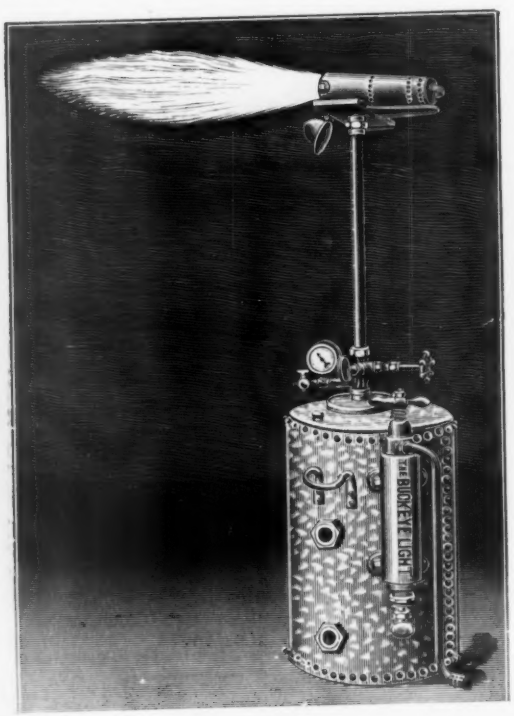

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There is only one light—the **Buckeye Light.** It is the only light that will penetrate smoke and steam. It is portable and flame can be adjusted to either a vertical or horizontal position.

You are going to have lots of work this winter. You will have to lengthen the short days in order to catch up with orders. You will want to give your men plenty of light to work by. It will pay you a hundred times over to do so.

Write for booklet describing these lights **now,** the days are getting shorter already.

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Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

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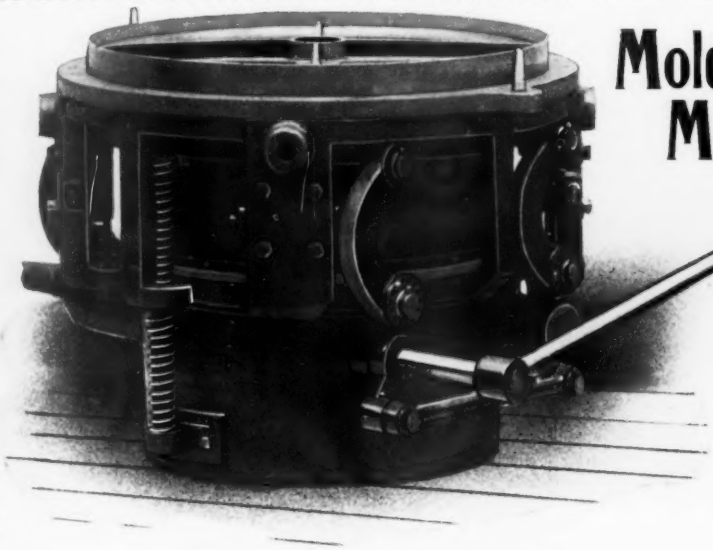

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of this type from 18 ins. to 120 ins. in dia. increasing 2 ins. to the size, with draws of 6 or 8 inches.

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THE GOBEILLE PATTERN COMPANY

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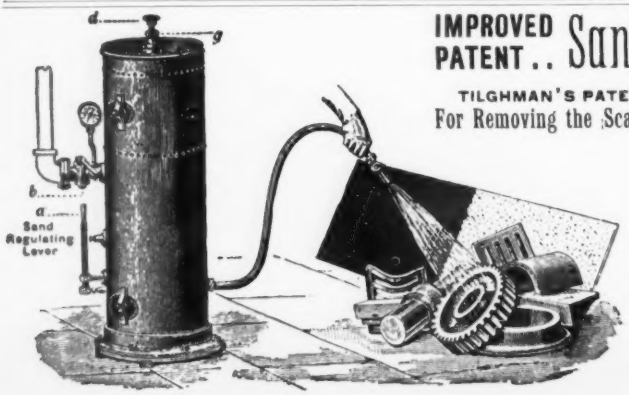

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For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

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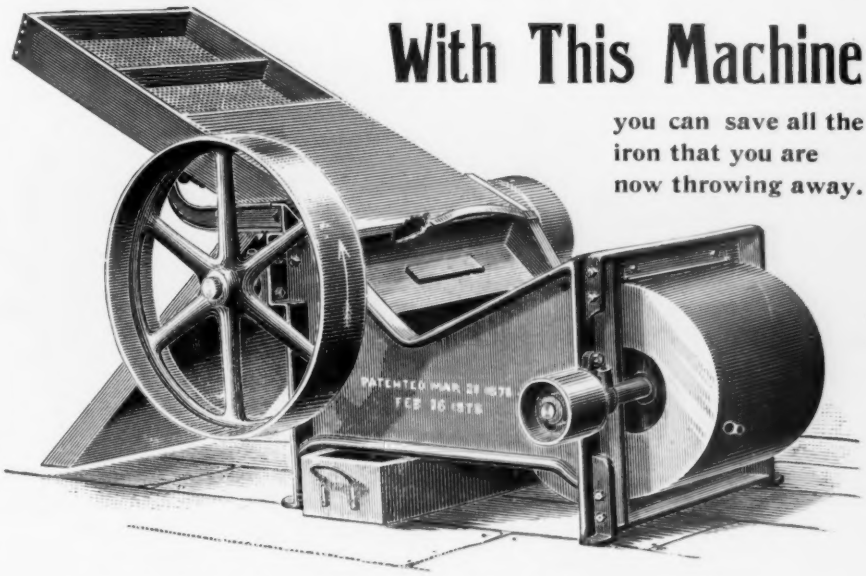

With This Machine

you can save all the iron that you are now throwing away.

To find out how this is done, send us your address.

Audubon Machine Works, New Haven, Conn.

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WOOD TRIMMERS
AND OTHER MACHINERY FOR
PATTERN MAKERS

Oliver Wood Trimmers trim hard or soft wood square or at any angle, leaving the trimmed surface as smooth as glass.

They trim so accurately that daylight cannot be seen through joints made by holding trimmed ends together.

They trim so rapidly that an hour's hand work can often be done in three minutes.

This is our No. 1. Our new Oliver Wood Trimmer book tells all about it, and a dozen other styles.

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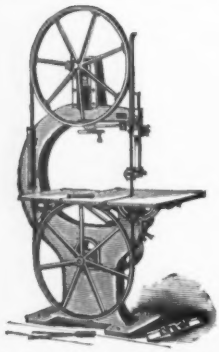

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... Complete Outfits ...

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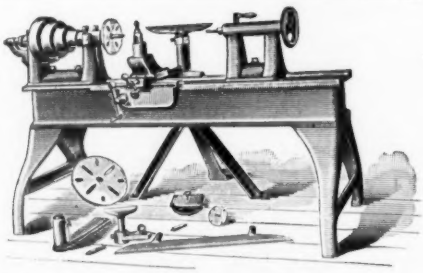
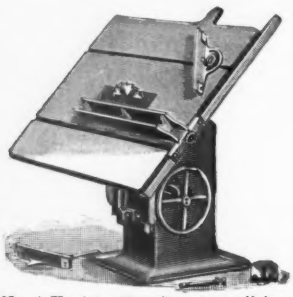
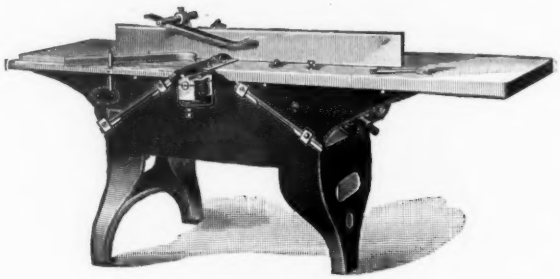


Pattern Makers' Lathes. Iron Bed with or without Carriage.

THE FRANK H. CLEMENT CO. 336 LYELL AVENUE, ROCHESTER, N. Y.



No. 1 Variety Saw Bench. All iron and steel.



A Good Opportunity

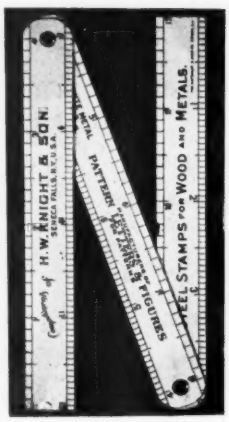
for a live man to step right into an established foundry and machine shop business, is offered in a town of 20,000 inhabitants, located in Wisconsin.

Transportation facilities are excellent. Besides being a Lake Port, there are four railroads entering the town.

The business has been established since 1868 and is in a paying condition.

A full chance is offered intending purchasers to investigate. Address,

FOUNDRY AND MACHINE SHOP,
Box 309, care The Foundry.
DETROIT.



This 12-inch Celluloid Rule

Will be SENT FREE

to any foundryman requesting it, as long as supply lasts.

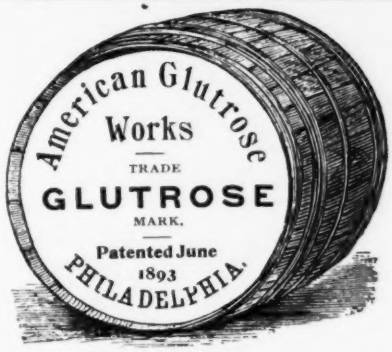
"It's a poor rule that won't work both ways."

We give you this rule—you send us your orders for Pattern Letters. See! Made in White Metal or Brass.

H. W. Knight & Son,

Drawer 1156. SENECA FALLS, N. Y.

GLUTROSE CORE COMPOUND



Used in the Penna. R. R. foundries and other first-class foundries throughout the United States and Europe.

NO BLOWN CASTINGS.

Makes first-class Radiator Cores without Rods.

Send for Samples and Testimonials.

AMERICAN GLUTROSE WORKS
Penn Mutual Insurance Building,
PHILADELPHIA.

YOUR IRON CONTRACTS

In making your contracts for 1899 for Lake Superior Charcoal Pig Iron, it would do no harm to take up the question of

"PIONEER,"
"ANTRIM,"
"ELK RAPIDS."

These three brands have given satisfaction in car and malleable work for years in the past and will continue to do so for years to come.

Superior Charcoal Iron Co

911, 912, 913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

WE ARE THE LARGEST MANUFACTURERS OF

Molder's Tools

IN THE WORLD.

Every First-Class Foundry Supply House and Hardware Store sells them.

If you want the Best Tools Made, be sure and order Tools manufactured by . . . .

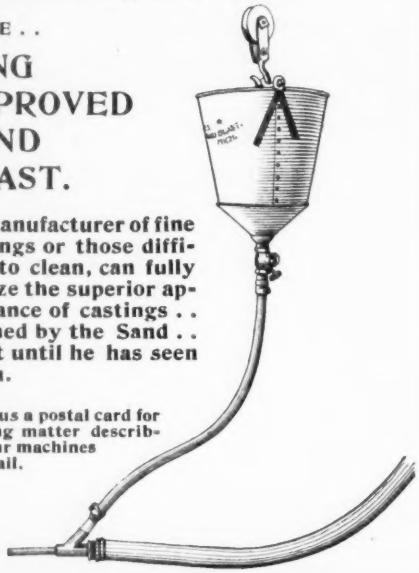
BURR'S DAMASCUS TOOL WORKS.

66-72 Fort Street East, DETROIT, MICH.

Better Than a Brush and Cheaper, too

IS THE . .

KING IMPROVED SAND BLAST.



No manufacturer of fine castings or those difficult to clean, can fully realize the superior appearance of castings . . cleaned by the Sand . . Blast until he has seen them.

Send us a postal card for reading matter describing our machines in detail.

THE KING IMPROVED SAND BLAST CO.,

STATION C, DETROIT.

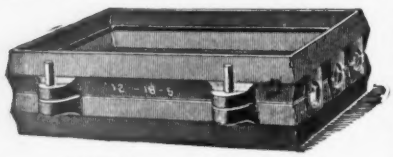
Hydrofluoric Acid

is the only acid to use in pickling castings. It dissolves the sand instead of the iron. The difference in this will be apparent to you after a trial. It will also be apparent in your castings. Don't break your castings in the tumbling barrel, when this cheap material will save them all. We ship our Hydrofluoric acid in barrels or lead carboys, convenient to handle.

Write us for printed matter on the subject of "Pickling Castings."

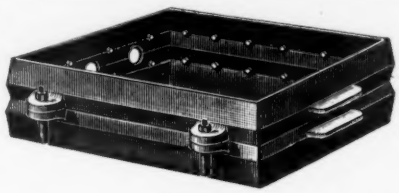
General Chemical Co., of Pennsylvania

PITTSBURGH.



HORIZONTAL LIGHT RIBBED.

Ribs in Beveled Flasks add to the weight and obstruct ramming—do you want them? You are the Doctor!



PORCUPINE.

(PAT. APPLIED FOR.) Made in 1898.

State Size. Ask for Price.

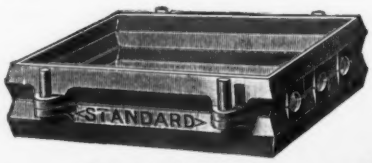
Estate of Oscar Barnett.

LONG DISTANCE PHONE 1045.

ESTABLISHED 1845.

NEWARK, N. J., U. S. A.

These Flasks are not milled with emery wheels and thrown together, but interchange and are perfectly fitted.



Makers of Everything for a Brass Foundry

PERPENDICULAR RIBBED.

DEMEREST'S PATENT, 1855.

OSCAR BARNETT'S OLD RELIABLE (Standard Beveled Style.)

IT LEADS.

NOT RIBBED.

Our own foundry insures prompt shipment. Faces planed level; don't rock.

STRAIGHT SIDE, BEAD AT TOP, BOTTOM AND PARTING.

Heyl & Patterson

ENGINEERS AND CONTRACTORS,

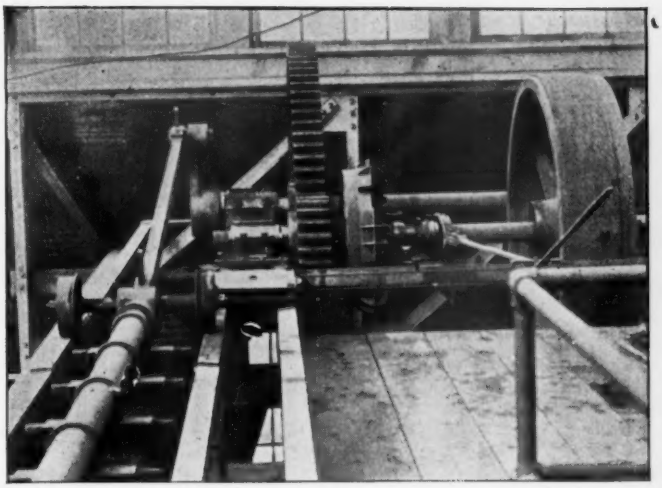
PITTSBURG, PA.

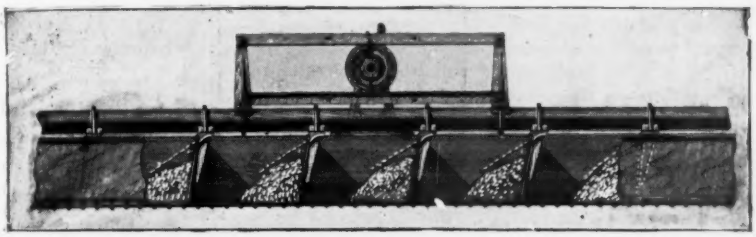
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

STEAM CRANES ELECTRIC

BELT & HAND POWER HOISTING APPLIANCES.

CASE MANF'G. CO. COLUMBUS, O.

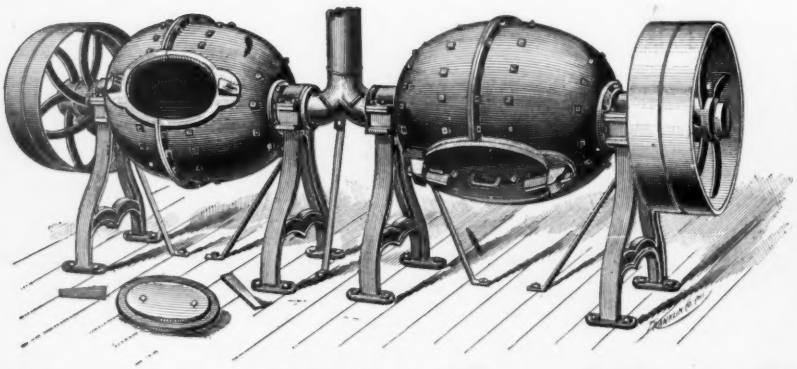
Eberhardt's Patented Sprue or Gate Cutter

Dear Sir:—The machine fills the bill; am just delighted with it.
Yours truly,
Maryland Brass & Metal Works,
Baltimore, Md.

Price Low

THE MARSHALL & HUSCHART MACHY. CO.,
Chicago and Cleveland,
Selling Agents.

GOULD & EBERHARDT, Send to NEWARK, N. J.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT, ILL

FARWELL'S **MOLDING MACHINES** Send for Catalogue

THE ADAMS COMPANY, DUBUQUE, IOWA

B. F. S. CO.'S **FLASKS**

ARE ALL RIGHT.

SO . ARE . PRICES.

Send for catalogue if interested. Send sample for Prices on Gray Iron Castings Our **Furnaces**, round steel shell, with drop grate, are up to date.

HAVE YOU SEEN IT IMITATED?

WHY IS IT DONE?

Patent No. 580,205.

We make . . **Clamps, Boards** and **Other Supplies Castings, too.**

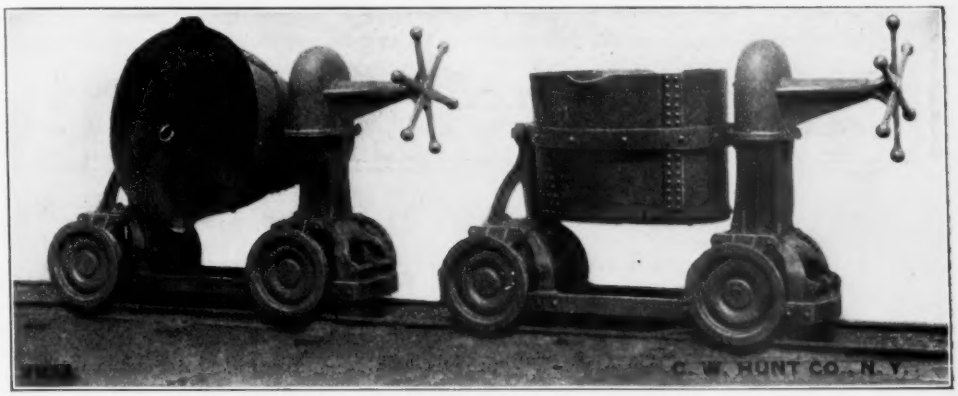
SELLING AGENTS.

S. OBERMAYER CO., Chicago and Cincinnati.

J. W. PAXSON CO., Philadelphia, Pa.

J. S. McCORMICK CO. Pittsburg, Pa.

BRASS FOUNDERS' SUPPLY CO., NEWARK, N. J.



Ladle Cars, 1,500, 2,000, 3,000 Pounds Capacity.

Many foundrymen believe that these cars are not only more convenient to use in distributing molten metal but are also safer than any overhead system of cranes or tackles. No accident has ever occurred in the use of these cars. The height of the top of the ladle above the rails, when upright, is 76 inches; for convenience in pouring into hand ladles, the shape of the body and the position of the trunnions are arranged so that the spout, when tipped, pours into a ladle 17 inches high. The gear for revolving the ladle, is our patent cam gear, that locks the ladle in every position, and possesses the remarkable feature of having both shafts revolve in the same direction. When the handles are moved, the ladle moves steadily in the same direction as the handles, but only one twelfth as fast.

Our system of narrow-gauge tracks, switches, curves, turntables, etc., for use in manufacturing establishments and to accommodate such special cars as the above, is worthy of careful investigation by those who are apt to be interested. Catalogue No. 9904 contains useful data, besides thoroughly treating this subject. Copies will be mailed to those interested. Please address the works direct.

C. W. Hunt Company, Brad Street, WEST NEW BRIGHTON, NEW YORK CITY.

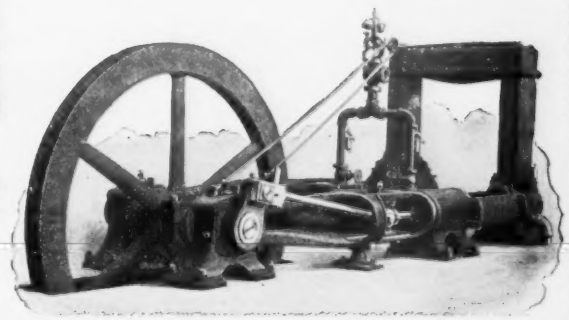
AIR AND GAS
COMPRESSORS
For FOUNDRIES.

Simple and Multiple Stage. Belt or Rope Driven. All Sizes. Special Patterns.

ROCK DRILLS.

RAND DRILL CO.

100 BROADWAY, NEW YORK.



AIR COMPRESSORS
FOR OPERATING

Pneumatic Chipping Hammers, Hoists, Casting Cleaners, Sand Blast Machines, Molding Machines and other appliances in foundry work.

COMPLETE OUTFITS FURNISHED AND INSTALLED.

For Circulars, Full Information and Prices, address . . Clayton Air Compressor Works

Havemeyer Building, 26 Cortlandt Street, NEW YORK.

Cast Steel Cement

It very often happens that a casting will have some little defect, which in no way injures its strength, but solely its appearance.

We have, after expensive experiments, succeeded in producing a cement which is practically cast iron in paste form, that upon application becomes as hard as the casting itself, has the same color and appearance, and effectually covers all such blemishes.

Write us for price list and sample.

D. N. Clark & Co., Shelton, Conn.

EMERY WHEELS

FOR FOUNDRY USE MUST BE

FREE CUTTING AND DURABLE.

We make a Specialty of Wheels for Grinding Castings and will Guarantee Satisfaction.

Catalogue upon Application.

American Emery Wheel Works, **PROVIDENCE, R. I.**

No. 7½ GRINDER.

This Grinder

was designed by us for foundry use. One stove maker has 16 of them. The distance between wheels is 48 inches, diameter of spindle between flanges 1¾ inches or 2 inches, as ordered. Babbitted boxes with three ring oilers. Weight, 1200 lbs. If you want a good substantial grinder write us for circulars and prices.

DIAMOND MACHINE CO. Providence, R. I.

MECHANICAL ANALYSIS

The Only Practical Method for . . . . MAKING CASTINGS
OF A DESIRED QUALITY
AT A LOW PRICE. ✻ Send for Testimonials and for Description of

W. J. KEEP, Detroit, Mich. KEEP'S TEST APPARATUS.

FOUNDRY MOLDING MACHINES, STRIPPING PLATE MACHINES, PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES.

U.S. TIN

is used in making brass and bronze castings; it makes a superior metal, sounder castings, more homogeneous in structure, richer color, better wearing metal, of higher surface lustre than alloy made with imported tin. U. S. TIN is to be used in same proportions as imported tin.

The Price is Much Lower.

The difference in price, the superiority of metal, and sounder castings should induce all users of metals to make comparative tests. We will send to responsible parties small lots of the U. S. TIN on approval, and if satisfactory, will make contracts covering a given time. Shall be pleased to correspond with all who may be interested.

THE AJAX METAL COMPANY, PHILADELPHIA, PA.

"Short Talks on Advertising."

224 pages, 123 illustrations; sent postpaid on receipt of price.

Paper binding, lithographed cover, 25 cents

Cloth and gold, gold top, uncut edges, $1.00

CHARLES AUSTIN BATES
Vanderbilt Building
NEW YORK

"Mr. Bates' Masterpiece. It is interestingly and readably written—more readable than one would believe possible on so hackneyed a subject as advertising—and it is illustrated by pictures intended to lend a humorous turn to many of the sentences in the text. For those who want a general idea of advertising principles, the book will be found valuable, and even the readers to whom its subject is more than familiar will find it an interesting companion for a leisure hour. It is full of apothegms, every one of which rings with a true note."—*Geo. P. Rowell.*

"Excellent Work."—*Buffalo Evening News.*
"Interesting and Profitable."—*Baltimore Herald.*
"Lively and Sensible."—*Philadelphia Evening Telegram.*
"Handsome and Clever."—*New York Press.*
"Should be read twice."—*Cleveland World.*
"Should be on the desk of every advertiser."—*Cleveland Press.*
"Best thing we have seen."—*Buffalo Express.*
"Most practical and helpful."—*Minneapolis Journal.*
"Every advertiser may read with profit."—*St. Louis Post-Dispatch.*
"Mr. Bates has rendered a service to all progressive business men."—*Philadelphia Record.*
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"Full of snappy, commonsense hints"—*Boston Advertiser.*
"Striking and Readable."—*Baltimore American.*
"Cannot fail to prove interesting."—*Pittsburg Press.*
"Should be in the hands of every business man."—*Philadelphia Ledger.*

Have you ever seen the record

Made by blast furnace No. 1, Ensley, Alabama? This furnace ran continuously four (4) years and two (2) days and made 253,533 tons of pig iron.

The greatest record ever made by any furnace in the South.

This furnace was lined exclusively with **"FRANKLIN CROWN"** and **"SLIGO" Fire Brick.** The best on earth. This record is equal to double the amount of northern ore.

Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

Exclusive agents for the Northwest.

DO YOU MAKE LIGHT OR HEAVY

Dry Sand and Skin Dried Work?

IF SO, YOU SHOULD USE

McCORMICK'S

VULCAN BLACKING.

It makes as clear and smooth a casting as the best plumbago and better than the silver leads. Not an experiment—in use in the largest foundries. A trial will satisfy you of its value.

MADE ONLY BY

J. S. McCORMICK CO., PITTSBURG, PA.

Are Your Customers Kicking

about your prices for iron castings, stoves, engines, etc.? If so, you will probable wish to show them the following facts regarding prices of your principal material, Pig Iron.

QUOTATIONS CASH F. O. B. CINCINNATI.

	Southern No. 2 Fdy.	Northern No. 2 Fdy.	Jackson Co. No. 1 S. G.
September 6th, 1896 -	$ 9.25	$12.00	$13.50
September 6th, 1897 -	9.25	10.50	12.50
September 6th, 1898 -	9.75	10.25	12.00
September 6th. 1899 -	20.25	22.00	28.00

If they wish to know whether prices will decline shortly, the following statistics of stocks at furnaces may give a pointer.

September 1st, 1896	-	976,624 tons.
September 1st, 1897	-	962,537 tons.
September 1st, 1898	-	710,448 tons.
September 1st, 1899	-	130,000 tons.

A close estimate indicates that production for this year will not exceed that of 1898 by more than 10 per cent, while consumption is so much greater that all surplus stocks will be used up before December 31st.

If you desire these facts and figures on a card in compact form for distribution among your customers, please write us for the number desired.

We are the largest sellers of Foundry and Forge Irons to actual consumers in the world, and in spite of the threatened famine are still able to supply our friends with both Iron and Coke. Write for prices.

Rogers, Brown & Company

CINCINNATI, BUFFALO, CLEVELAND, NEW YORK, PHILADELPHIA, BOSTON, CHICAGO, PITTSBURGH, ST. LOUIS.

This is What We Have to Offer You—

THE BEST AT LOWEST PRICES.

Shovels
Riddles
Brushes
Bellows
Molders' Tools
Chaplets
Crucibles
Pattern Letters
Hay Rope
Coke Forks
Mallets
Pattern Dressing
Buckets
Brass Sand
Etc., Etc.

SEND
FOR
GENERAL
CATALOG
No. 26

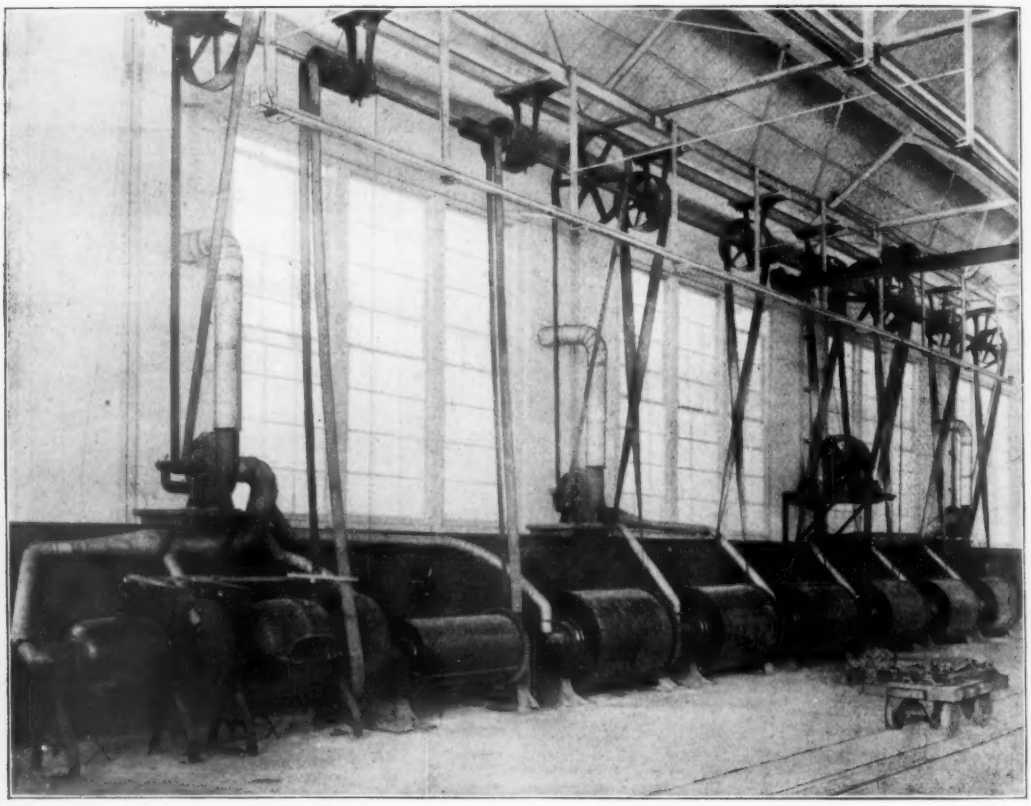
Pure East India Plumbago
American Graphite
Sea Coal or Bituminous Facing
Heavy Machinery Facing
Reliance Dry Sand Blacking
Core Compound
Peerless Core Wash
Talc
Perfect Core Wash
XXX Heavy Stove Plate
and
National Return Facing
Fire Brick and Cupola Blocks

THE S. OBERMAYER CO.

CINCINNATI, OHIO. * CHICAGO, ILLINOIS.

Paxson Exhaust Rumblers

MADE OF STEEL.



No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors. We also supplied them with two egg-shaped Rumblers, as shown in the cut.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

LOCATION AND AREA OF TUYERES INSURE THE HIGHEST MELTING . . . EFFICIENCY. . . . . .

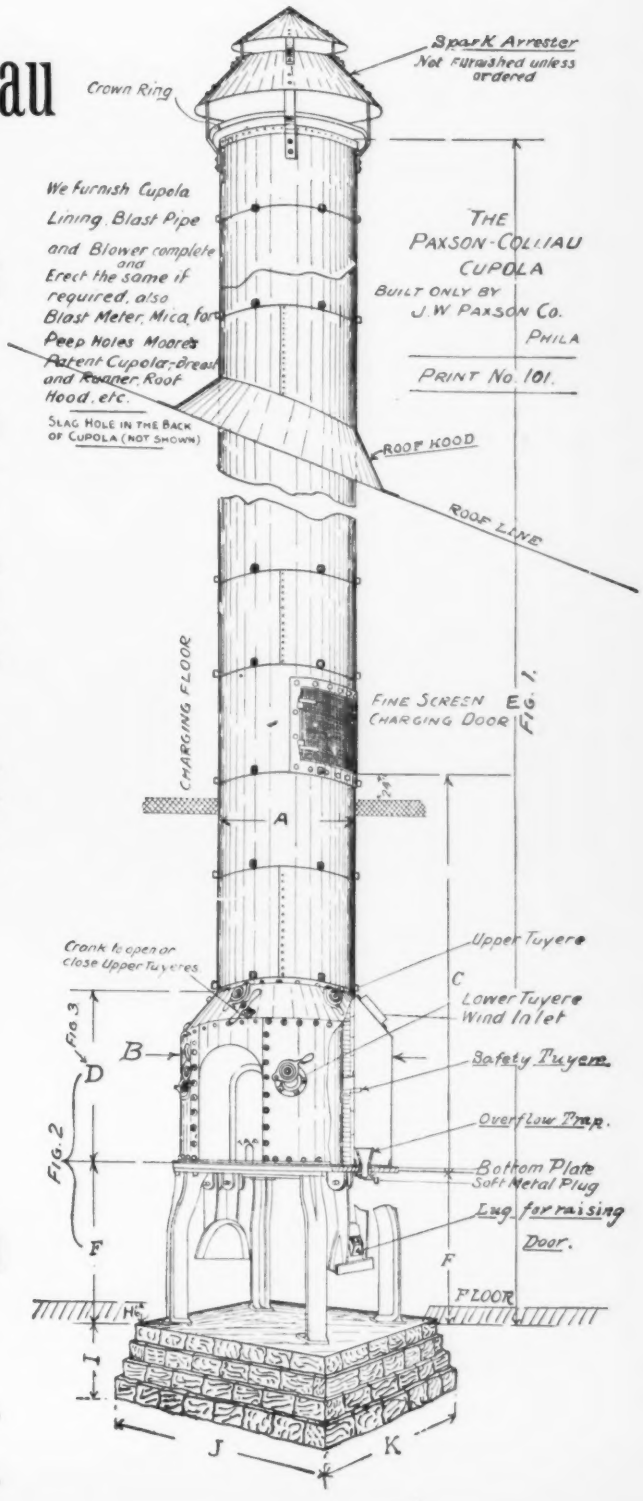
It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

J. W. Paxson Co

1021 . . .
North Delaware Avenue,

PHILADELPHIA, PA., U. S. A.



Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.

CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

Joseph Dixon Crucible Co.

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand

FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

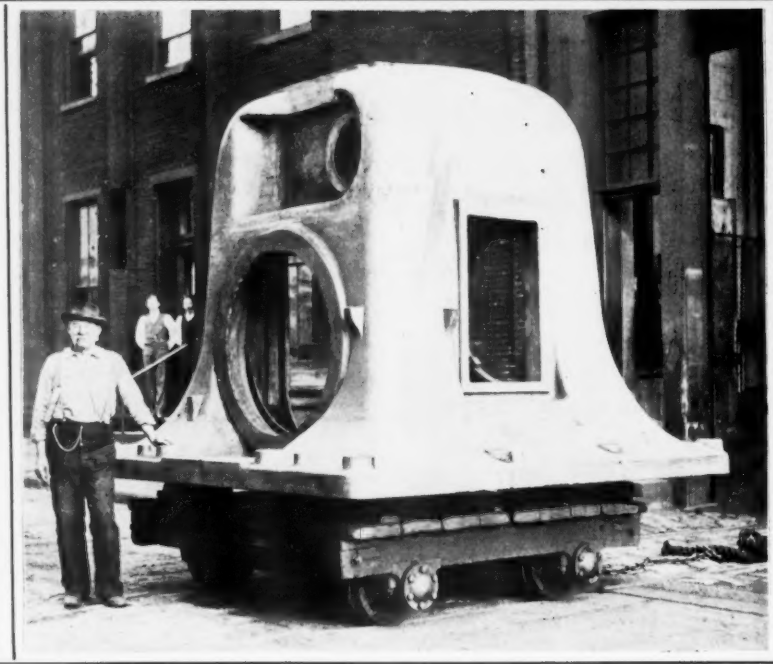
537=39 *West 27th St.,*
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS. N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.



AS WE HAVE SAID a great many times, when it comes to big work, the **Cleveland Facing Mill Founders Perfect Wash,** or, as it is called for short, the **C. F. M. Founders Perfect Wash,** is the thing that adds the finishing strokes to the perfect casting.

It not only makes a casting look better, but the casting can be cleaned in less time. This is a money value the **C. F. M. Founders Perfect Wash** possesses besides its ability to make castings look better.

Have you seen the **Perfection Core Box?** If not, send for a sample and some reading matter about it. It comes in all diameters and lengths; all you have to do is to cut it off to suit.

Foundry Supplies are not a side line with us, like they are with some people. We have an interesting book about them which you can have by supplying us with your address.

THE CLEVELAND FACING MILL CO

FRANK H. CHAMBERLIN, PROPRIETOR. CLEVELAND, OHIO

The J. D. Smith Foundry Supply Co.

MANUFACTURERS OF
ALL KINDS OF

FOUNDRY FACINGS and BLACKINGS . .

IMPORTERS AND REFINERS OF

Plumbago, Silver and Black Lead,

AND MANUFACTURERS OF AND DEALERS IN

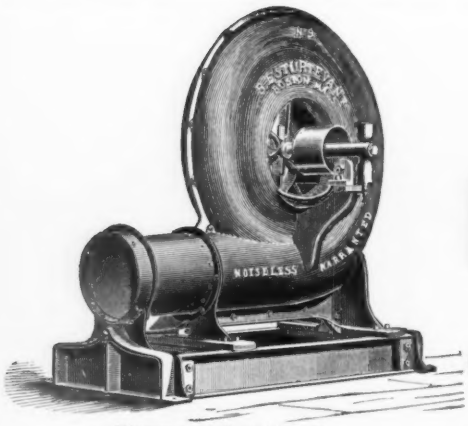
Supplies for Iron and Brass Foundries

Patternmakers, Machinists, Rolling Mills, Furnaces and Steel Works.

Largest Handlers of Monk's Molders' Tools in America.

MILLS—KINDEL AND CENTRAL AVES.
OFFICES—2143 CENTRAL AVE.

CINCINNATI, O., U. S. A.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

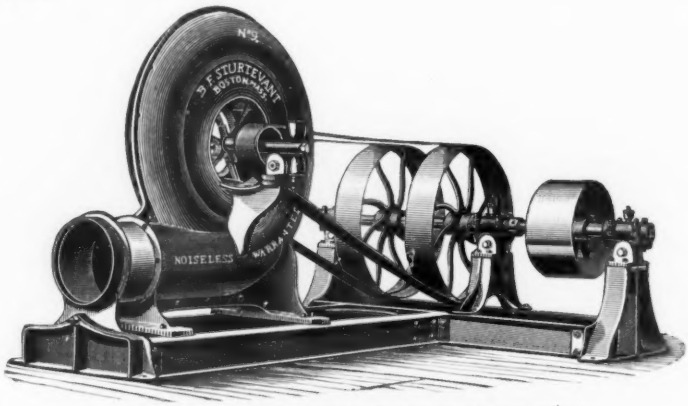
—FOR—

Cupola Furnaces and Forge Fires.

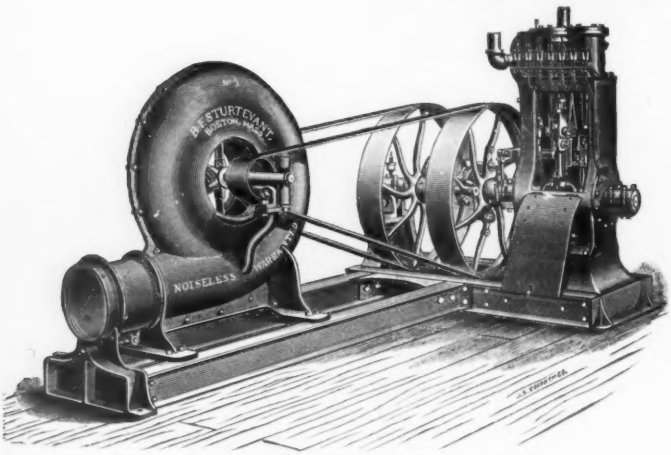
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

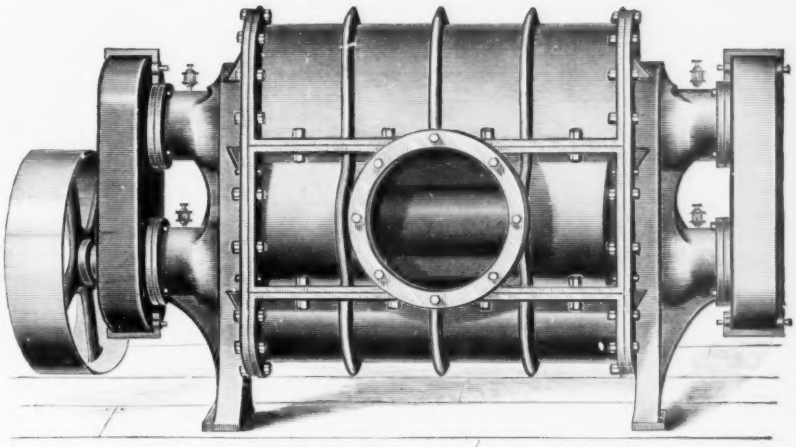
B. F. STURTEVANT CO.,

BOSTON MASS.

131 Liberty Street, NEW YORK, 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: Frazer & Chalmers, Inc. CHICAGO, ILL., and BRANCH HOUSES.

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WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal.

5000 Tons Daily Capacity.

300 30-TON COAL CARS

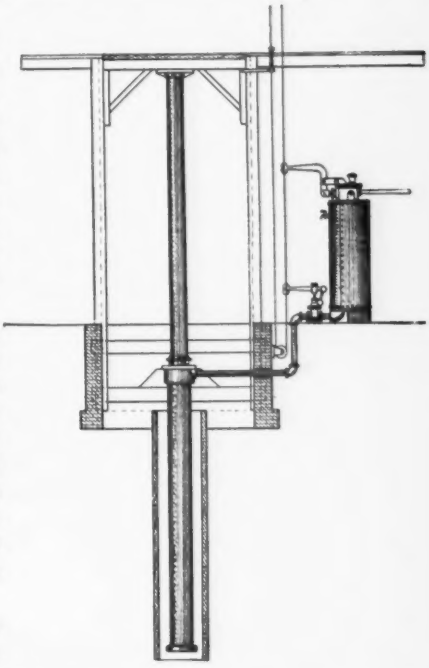
50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

FUNNY, AIN'T IT?



How things turn out!

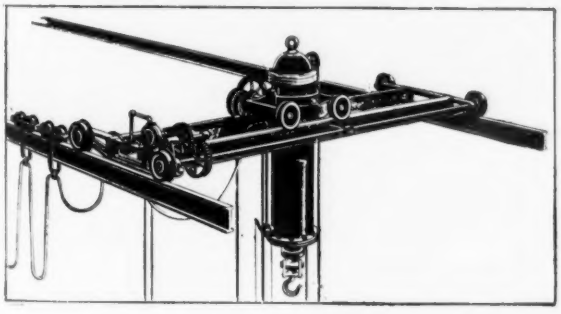
Now here's this Steam Hydraulic Elevator of ours. We never started out to get into the Elevator business. Our effort has been to sell Ridgway Cranes. But a fellow persuaded us to make him an elevator on same plan as the crane for taking stuff up to his cupola. It worked so fine it tickled him all to pieces. Another fellow saw it and he wanted one, and then another and another, till lots "got on" to the elevator, and all were so enthusiastic about it that we caught the fever, too, and began to yell at the tail end of our Crane card, "Please take the Elevator."

Then the world at large began to find out about the Ridgway Elevator. Among others, it attracted the attention of professional engineers, and these "college fellers" wanted to know how the Steam Hydraulic compared in economy with the ordinary pump Hydraulic. So they rigged up their scales and their barrel of cold water and went to weighing the steam used; and like to have had their breath taken away by finding that the Steam Hydraulic used 60 per cent. less steam to lift a load than the Pump Hydraulic.

When this fact became known, people began ordering Steam-Hydraulic Elevators worse than ever.

The only reason you don't get one of these wonderful elevators is because you don't know about it. It is so far and ahead superior to all other elevators thas there is really no comparison. We can send you a "barl" of "testimonials" if you want them.

HYDRAULIC AIR HOISTS



The greatest air hoist ever designed. Just what everyone wants. Costs more than other hoists, but is worth the difference many times over. We want you to get a sample machine, hang it up and try it. If you don't think it is worth its cost, send it back. The latest improved Oil Governed Hoist is now perfect.

You Ought to See the Crane Getters These Days.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

EUROPEAN AGENT,

CHAS. G. ECKSTEIN, 16 Spandauerstr., Berlin, Germany.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.

ECONOMICAL.

EXPEDITIOUS.

NOTE. — The old-fashioned method of sifting sand has been to a large degree superseded in modern foundries by the Superior Centrifugal Method, and the machine illustrated herewith is a real labor saver.

Correspondence Is Solicited.

Over
15,000
in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

ROSS MEEHAN FOUNDRY CO.,
CHATTANOOGA, TENN., May 5, 1896.

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

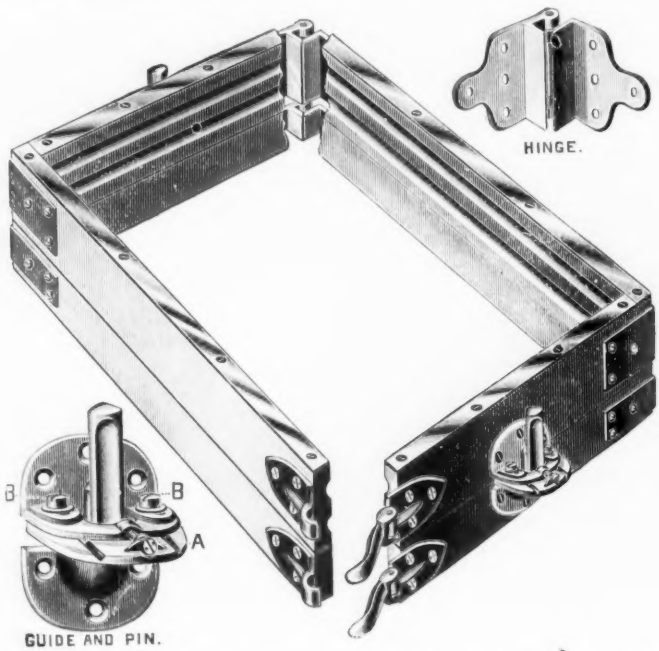
Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y, & Treas.

Stearns Improved Snap Flask

Cheaper Than You Can Make Your Own.

The large "V" shaped pins with corresponding bearings insure a level lift of the cope, enabling comparatively inexperienced help to mold difficult patterns.

The inner edges of the malleable iron hinge are beveled, bringing the corners perfectly true. The flasks are made of whitewood — light in weight, yet stiff and strong, edges and corners bound with iron.



These sizes, which are inside measurement, with 2-inch nowel and 3-inch cope, are kept in stock:

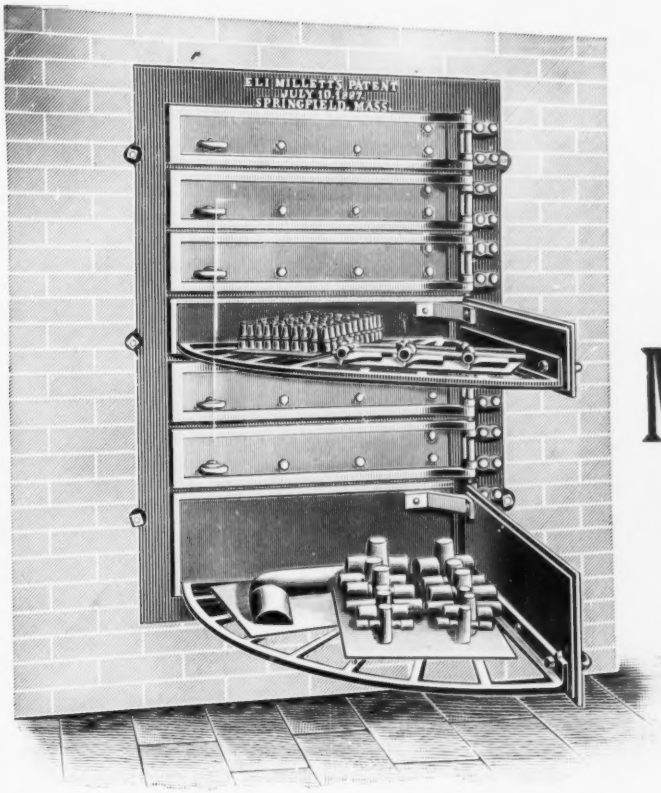
No.	Sizes.	No.	Sizes.	No.	Sizes.	No.	Sizes.
1	9x13	8	10x13	15	11x13	22	12x13
2	9x14	9	10x14	16	11x14	23	12x14
3	9x15	10	10x15	17	11x15	24	12x15
4	9x16	11	10x16	18	11x16	25	12x16
5	9x17	12	10x17	19	11x17	26	12x17
6	9x18	13	10x18	20	11x18	27	12x18
7	9x19	14	10x19	21	11x19	28	12x19

PRICE, $2.50 Each. Special Sizes furnished at an advance of **25** cents, net, each.

The metal furnishings, only, will be sold to parties desiring to make up their flasks. **Price, $1.50 per set.**

E. C. STEARNS & COMPANY, Syracuse, N. Y.

Makers of STEARNS BICYCLES and Manufacturers of Hardware.



Here is the Millett Core Oven

set in a solid, substantial manner, handy to get at at all times. No smoke when you want a core—the back door takes care of that. No escape of heat, either—the back door takes care of that, too.

Here is the only Core Oven that you can get a core out of any time of the day without cooling the oven off and thus stopping it from baking the rest of the cores it contains.

The **Millett Core Oven** is the only oven that can be kept in constant operation and from which you can get a small core or a large one just whenever you want it.

For foundries that need cores at all hours of the day, it is the only oven. We have a booklet that tells about it. This goes to you if we know you want it. Maybe we can refer to one of our customers in your neighborhood, if you like to see how the **Millett Core Oven** works.

These Ovens can be seen in the show rooms of the J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.

Millett Core Oven Co., Brightwood, Mass.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

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ROOTS' BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS
BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

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PITTSBURG, PA.

EDMUND A. FORDYCE,
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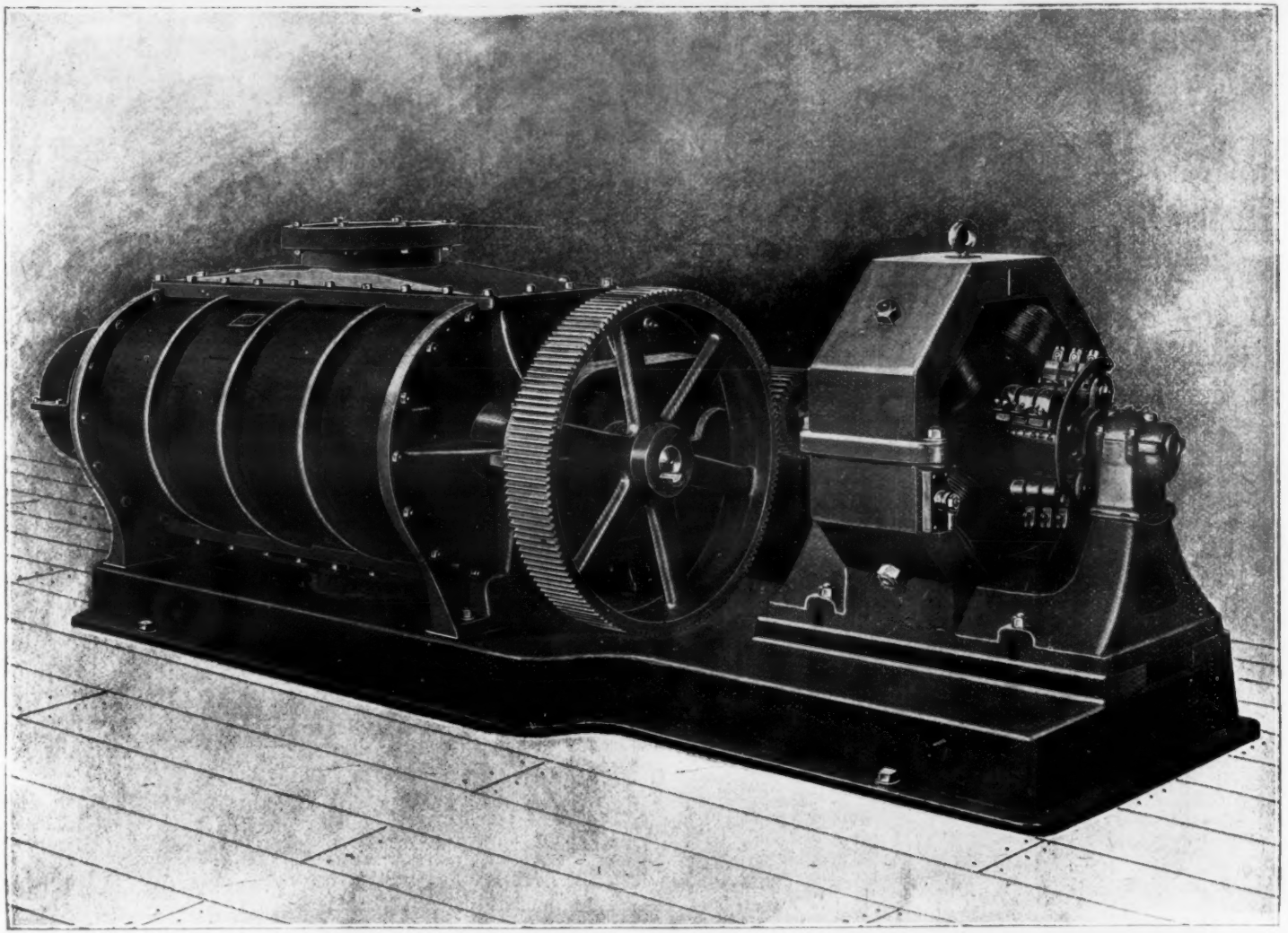
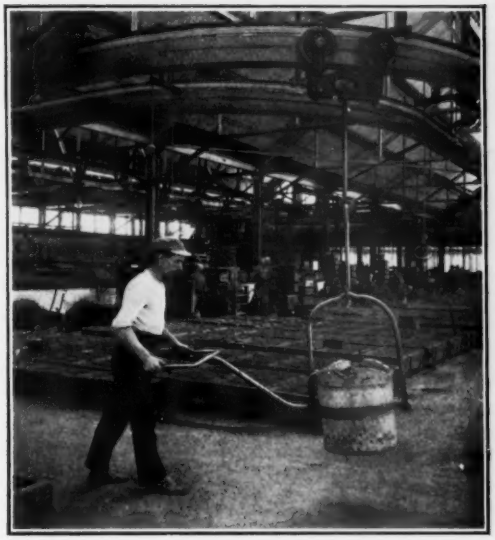


ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

Notice this man walking along with a ladle of iron!



WOULD you believe he is doing the work of half a dozen men? He is! He is doing it with greater comfort, too! When he gets through with his work, he doesn't look like he came out of a "slaughter house." The molders to whom he is distributing iron are also taking some interest in life. They are not played out every night in pouring off. They are ready to do a good day's work the next morning.

The foundry that has the **Coburn Trolley Track,** has a machine that takes the mule-work away from its workmen.

By doing away with brute force, the workman can pay more and better attention to other things. That is where the money comes back to you.

Send us a pencil sketch of your shop and we will send you some interesting figures.

COBURN TROLLEY TRACK MFG. CO., HOLYOKE, MASS.

Help Nature

when Nature is helping you.

GET your supply of molding sand *now*, when it is in the best condition for shipping. If it is a little too dry to suit you, you can easily supply the water needed. You have got it right on your place, and the beauty of adding the water yourself is that you don't put more on than is needed; again, you don't have to pay freight on it. It costs money to dry muddy molding sand, and, what is worse, adding the new sand to your sand heap in that condition, causes a loss of castings.

Zanesville Molding Sand can be had in all grades to suit all classes of work. It is plentiful enough to allow it to be sold at a fair price. The territory where it is found is blessed with competing freight lines and cheap rates in all directions.

Some molding sands come at a higher price, but there are none better. We have made it a business to supply foundries for more than twenty years. We have not gone at it by jerks, like other people. Our experience goes to our customers without extra charge. You may have trouble with your cupola lining not lasting as long as it should. Maybe your ladles burn through or have to be re-lined every time you use them. If so, our **Crude Plastic Fire Clay,** mixed with our **Bank Fire Sand,** forms a combination that will put you on your feet and make you forever remember the name of Zanesville. It won't cost much to find out what we can lay these materials down for in your own town. Dictate a few lines to us on this subject now.

E. M. AYERS, Market Block, ZANESVILLE, O.

H. S. VROOMAN, Western Agent, 220 W. 20th St., CHICAGO.

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PITTSBURG, PA.

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CHICAGO OFFICE: 1543 MARQUETTE BUILDING.

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Engineers and Designers of Complete Plants for the Manufacture of

CAST IRON CHILLED CAR WHEELS
(WHITING PATENT SYSTEM.)

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(GAS and WATER.)

MALLEABLE AND STEEL CASTINGS

OUR SPECIALTY—

ALL TYPES OF CRANES.

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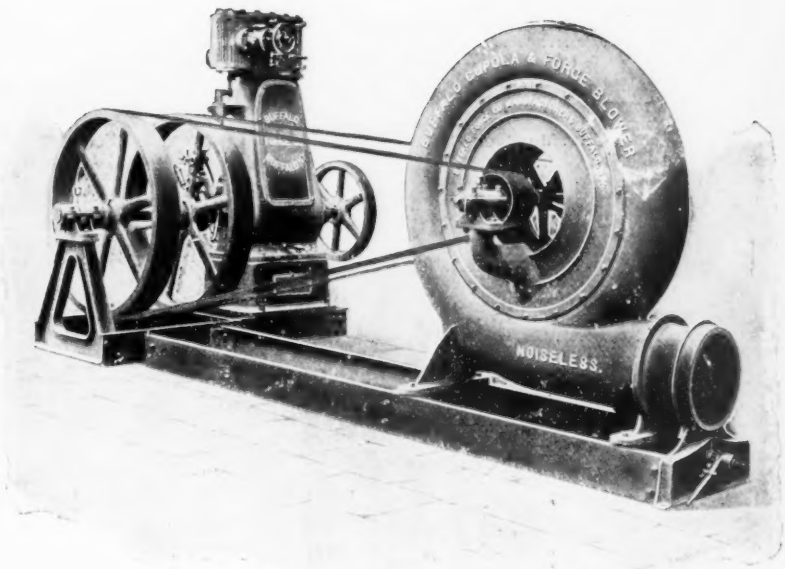
EXPORT BUSINESS SOLICITED. SEND FOR CATALOGS.

BUFFALO CUPOLA BLOWERS.

BUFFALO TUMBLING BARREL EXHAUSTERS.



Buffalo Steel Pressure Blower on Adjustable Bed, with Combined Engine and Countershaft.

Buffalo Forge Company,

BUFFALO, N. Y., U. S. A.

The Buffalo Fan System of Heating and Ventilating Foundries, Machine Shops, and all Large Buildings.

The Buffalo Forge Company Engine for Select Service. Highest Award and Gold Medal, Omaha, 1898.

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ARE THE SAME TO EVERYBODY.

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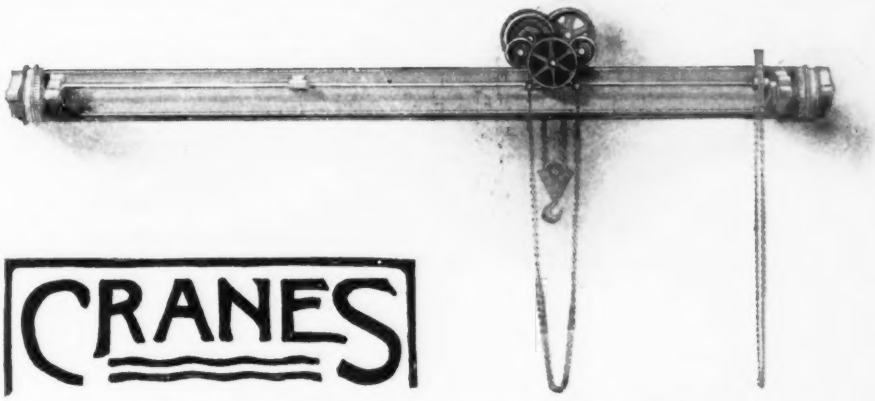
Most foundries have tried to pickle castings. The chances are you have been among the number.

Maybe you didn't do quite as good a job as you would have liked to have done. Maybe you found the cost rather high. At any rate, we know you have not reached perfection in pickling castings unless you are using

HYDROFLUORIC ACID

in doing this. This acid dissolves the sand instead of the iron. We ship it in barrels or lead carboys, easy to handle. We have some printed matter that will educate you on the subject of pickling castings. Shall we send it to you?

General Chemical Co., of Pennsylvania,
PITTSBURGH.



CRANES

This Crane is adapted to every kind of foundry and shop duty. Wire hoisting rope is wound on a drum, giving a very steady lift. All motions are by hand chains. Our Catalogue No. 10 tells about it; also about many other types.

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ELECTRIC, COMPRESSED AIR, STEAM AND HAND POWER CRANES.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

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Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

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CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

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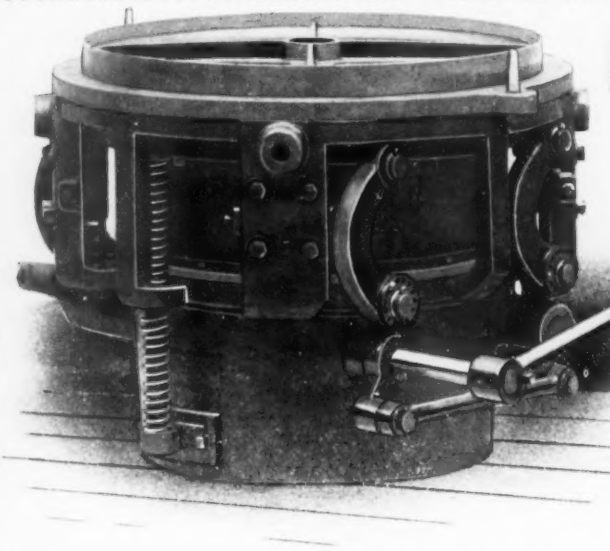

Molding Machines

of this type from 18 ins. to 120 ins. in dia. increasing 2 ins. to the size, with draws of 6 or 8 inches.

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HENRY E. PRIDMORE, S. E. Cor. Nineteenth and Rockwell Sts. CHICAGO, ILL.

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Agent for Eastern Pennsylvania, Western New Jersey, Delaware and Maryland.

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ALL STYLES **CRANES** ANY CAPACITY

THE **CASE** MANUFACTURING CO.,

COLUMBUS, OHIO.

The Encyclopedia of Founding

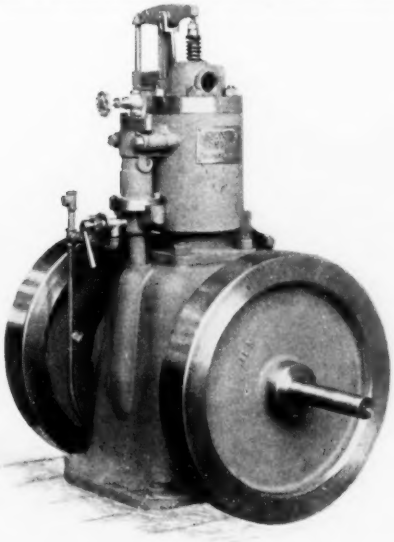
is the latest book issued by . . . .

SIMPSON BOLLAND

It deals in a descriptive manner with all subjects connected with the foundry. Nothing is missed. As a complete work of reference, nothing like it was ever attempted.

"The Encyclopedia of Founding" contains 535 pages.

Price, $3.00 — The Foundry Publishing Co., Detroit.



Have you an isolated machine that you want to drive intermittently? A Blower, Tumbler, Sand Sifter, Elevator, Do you know our **Peerless Gas Engine** will do it fifty per cent. cheaper than any other power?

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4 CHENE STREET, DETROIT, MICH.

Mark Your Patterns!

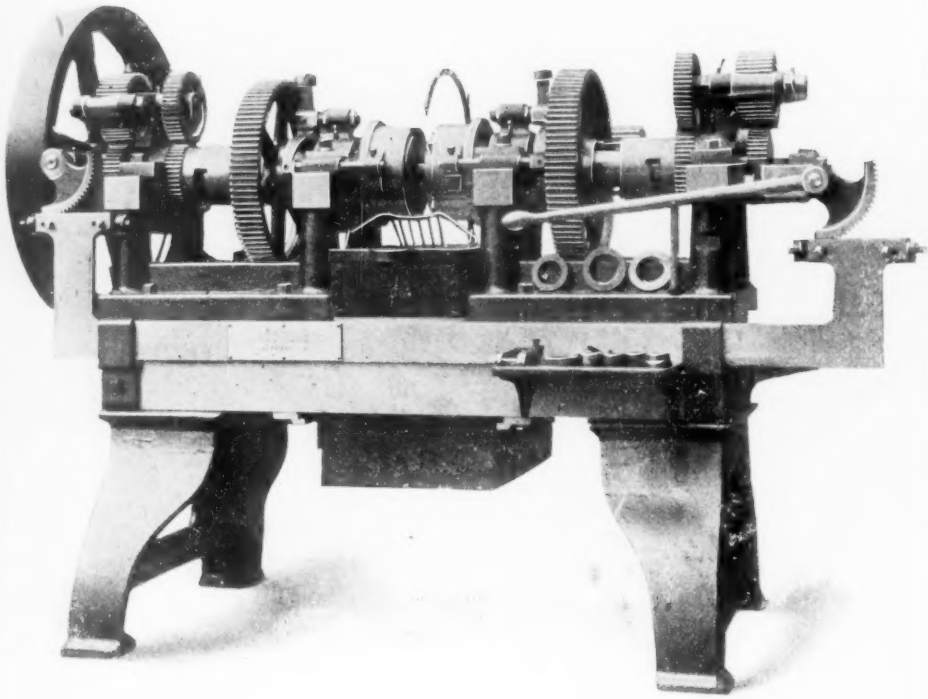
Mark them so that you can lay your hands on them any time and tell just what machine they belong to.

This will save you worry and money.

We make **Pattern Letters** and **Numbers**—the best kind only. A postal card brings our prices.

H. W. KNICHT & SON.
SENECA FALLS, N. Y.
DRAWER 1156.

Radiator Appliances ..

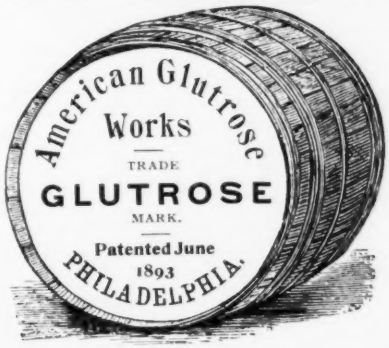


We are prepared to submit estimates and furnish promptly machinery and equipments of all kinds for the manufacture of Radiators of every description, including **Patterns, Flasks, Core Boxes, Nipple Cutting Machines, Automatic Reaming and Tapping, Assembling and Testing Machinery.**

Twenty Years' Experience in
Practical Radiator Manufacture.

O. BRYANT, SONS & CO., 1453 NIAGARA STREET, BUFFALO, N. Y.

GLUTROSE CORE COMPOUND



Used in the Penna. R. R. foundries and other first-class foundries throughout the United States and Europe.

NO BLOWN CASTINGS.

Makes first-class Radiator Cores without Rods.

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PHILADELPHIA.

YOUR IRON CONTRACTS

In making your contracts for 1899 for Lake Superior Charcoal Pig Iron, it would do no harm to take up the question of

"PIONEER,"
"ANTRIM,"
"ELK RAPIDS."

These three brands have given satisfaction in car and malleable work for years in the past and will continue to do so for years to come.

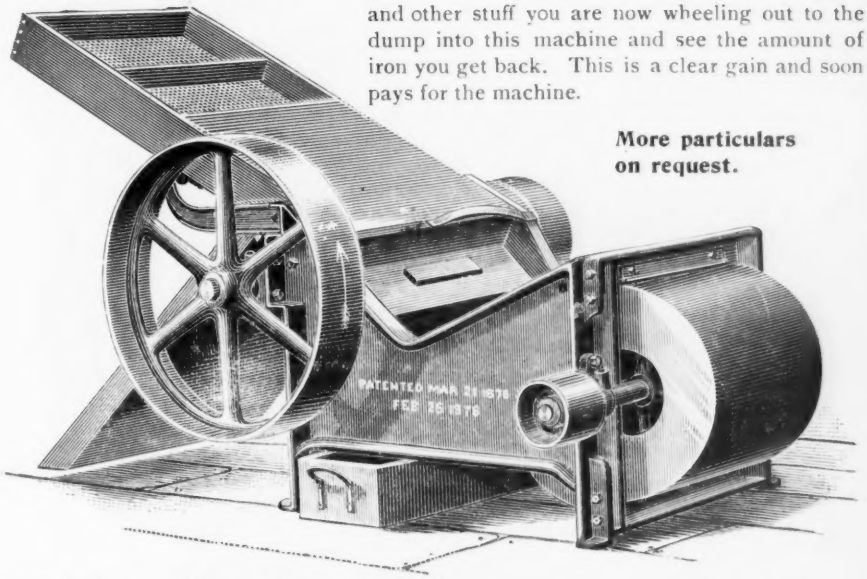
Superior Charcoal Iron Co

911, 912, 913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

Throw Your Gangway Screenings

and other stuff you are now wheeling out to the dump into this machine and see the amount of iron you get back. This is a clear gain and soon pays for the machine.

More particulars on request.



Audubon Machine Works, New Haven, Conn.

This No. 3 Oliver Wood Trimmer cuts the largest range of angles of any machine made. It has the largest capacity and is very recent in design. No. 3 Oliver Wood Trimmers have auxilary guages for trimming segments; also triangle guages for trimming a shoulder on a tennon, mitering a crown moulding, mitering a piece the full width of machine, etc. We'd like to tell you more about this No. 3, and a dozen other styles, too. Our Oliver Wood Trimmer Book costs nothing.

AMERICAN MACHINERY CO.
GRAND RAPIDS, MICH.

OLIVER WOOD TRIMMERS FOR PATTERN MAKERS

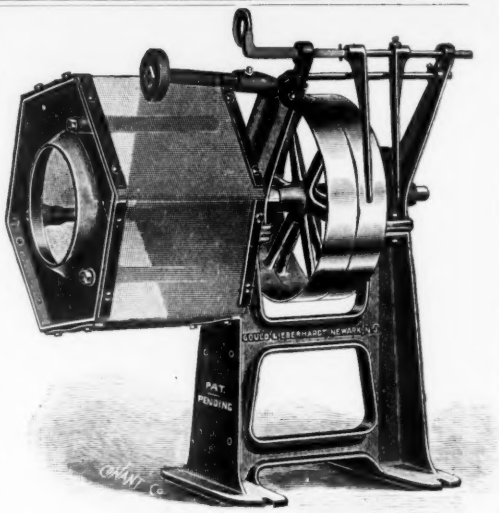
Hitting the Road

is one way of obtaining experience, but it is slow. You get a chance to count the ties—but that doesn't make you a better mechanic. You learn to ride a freight car bare-back—but that has got nothing to do with your trade. You get busted—that is disagreeable. Just stay where you are and we will furnish you with enough condensed experience to make you fat. If it's too strong for you, it can be diluted. You will move up in front, instead of being in the tail end of the procession, where you are now. You can have our services for almost nothing.

THE FOUNDRY beats a Side-door Pullman for getting there.

Ticket, good for 12 months, One Dollar.

SHALL WE GIVE YOU A RIDE . . . ?



EBERHARDT'S IMPROVED AUTOMATIC SAND SIFTER.

Messrs. Gould & Eberhardt, Newark, N. J.:

GENTLEMEN—As to the working of the Sand Sifter, it is *more than satisfactory*. After using a shaker, which not only shook the sand, but also shook itself apart periodically, it is a great relief, doing its work *quietly* and *thoroughly*, and we shall be pleased to recommend it to anyone you may refer to us. Yours truly,

BELL & FYFE FOUNDRY CO.

GOULD & EBERHARDT, NEWARK, N. J.

Domestic Agents—Manning, Maxwell & Moore, *New York*; U. Baird Machinery Co., *Pittsburgh, Pa.*; The Marshall & Huschart Machinery Co., *Chicago and Cleveland*.

Heyl & Patterson

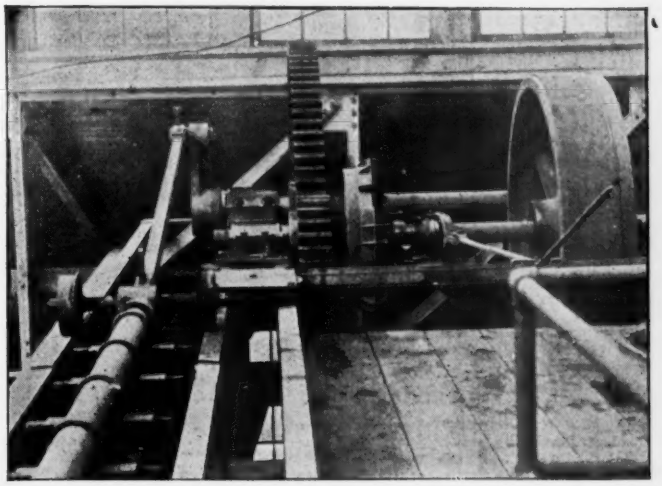
ENGINEERS AND CONTRACTORS,
PITTSBURG, PA.

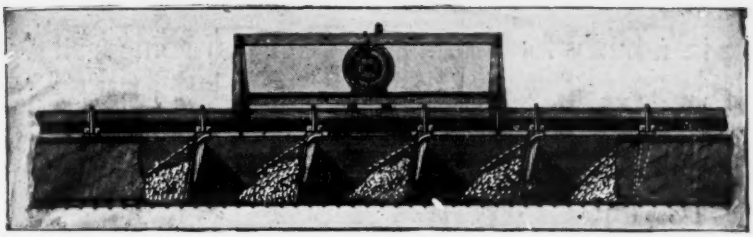
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

To Repair a Blemish

which only injures the appearance of a casting and not at all its usefulness, apply **Clark's "Cast Steel Cement."**

This Cement, as near as it can be described, is cast iron in a paste form. Upon application, it becomes as hard as the casting itself, retaining the same color and general appearance.

Send us your address and we will forward price list and a sample.

D. N. CLARK & CO., Shelton, Conn.

The Barnett Foundry Co.,

(Successors to Estate of Oscar Barnett.)

ESTABLISHED 1845. NEWARK, N. J.

will continue to manufacture everything needed by Brass Foundries.

The Barnett Flasks have become the Standard, which all others are trying to approach.

We can give prompt shipment to all orders received. Our own foundry guarantees us a constant source of supply.

If you are in a hurry for anything to keep you going, call us up by

Long Distance Phone 1045.

We not Only Make a Wheelbarrow

that is serviceable and lasting in the hard usage of the foundry, but we make our wheelbarrows of such a design that a man will do more work with them than with any other kind.

We make barrows suitable for any kind of foundry work. Write us for catalog and price list.

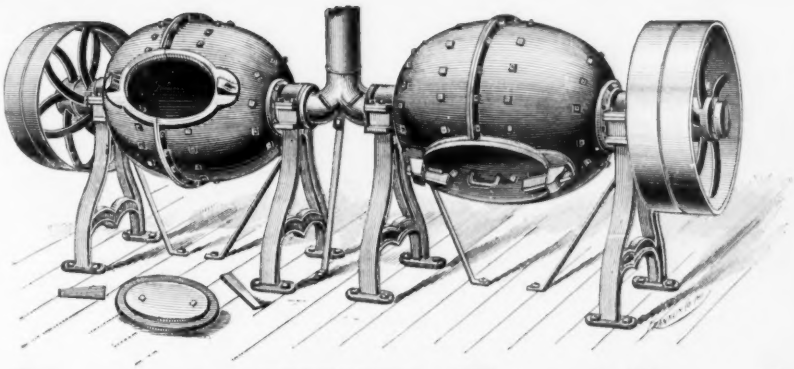
AKRON CULTIVATOR CO., Akron, Ohio.

No. 7½ GRINDER.

This Grinder

was designed by us for foundry use. One stove maker has 16 of them. The distance between wheels is 48 inches, diameter of spindle between flanges 1¾ inches or 2 inches, as ordered. Babbitted boxes with three ring oilers. Weight, 1200 lbs. If you want a good substantial grinder write us for circulars and prices.

DIAMOND MACHINE CO. Providence, R. I.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT, ILL

FARWELL'S **MOLDING MACHINES** Send for Catalogue

THE ADAMS COMPANY, DUBUQUE, IOWA

B. F. S. CO.'S FLASKS

ARE ALL RIGHT.

SO . ARE . PRICES.

Send for catalogue if interested. ∴ Send sample for Prices on Gray Iron Castings Our **Furnaces**, round steel shell, with drop grate, are up to date.

HAVE YOU SEEN IT IMITATED?

WHY IS IT DONE?

Patent No. 580,205.

We make . . **Clamps, Boards** and **Other Supplies Castings, too.**

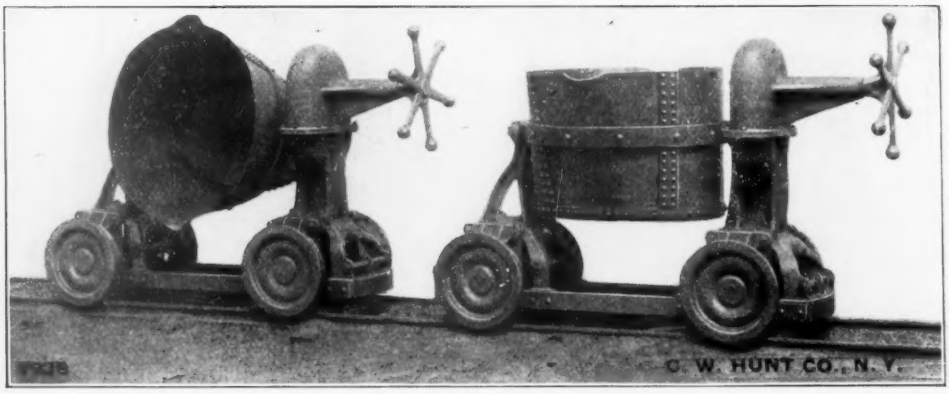
SELLING AGENTS.

S. OBERMAYER CO., Chicago and Cincinnati.

J. W. PAXSON CO., Philadelphia, Pa.

J. S. McCORMICK CO Pittsburg, Pa.

BRASS FOUNDERS' SUPPLY CO., NEWARK, N. J.



Ladle Cars, 1,500, 2,000, 3,000 Pounds Capacity.

Many foundrymen believe that these cars are not only more convenient to use in distributing molten metal, but are also safer than any overhead system of cranes or tackles. No accident has ever occurred in the use of these cars. The height of the top of the ladle above the rails, when upright, is 26 inches; for convenience in pouring into hand ladles, the shape of the body and the position of the trunnions are arranged so that the spout, when tipped, pours into a ladle 17 inches high. The gear for revolving the ladle, is our patent cam gear, that locks the ladle in every position, and possesses the remarkable feature of having both shafts revolve in the same direction. When the handles are moved, the ladle moves steadily in the same direction as the handles, but only one-twelfth as fast.

Our system of narrow-gauge tracks, switches, curves, turntables, etc., for use in manufacturing establishments and to accommodate such special cars as the above, is worthy of careful investigation by those who are apt to be interested. Catalogue No. 9904 contains useful data, besides thoroughly treating this subject. Copies will be mailed to those interested. Please address the works direct.

C. W. Hunt Company, Brad Street, WEST NEW BRIGHTON, NEW YORK CITY.

AIR AND GAS COMPRESSORS

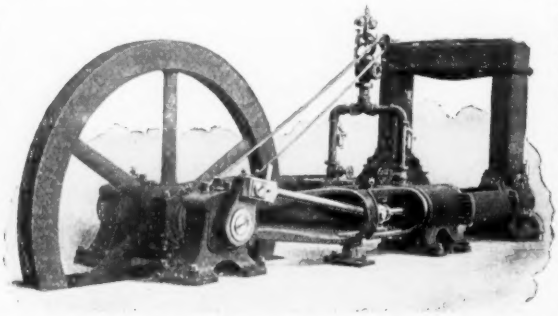
For FOUNDRIES.

Simple and Multiple Stage. Belt or Rope Driven. All Sizes. Special Patterns.

ROCK DRILLS.

RAND DRILL CO.

100 BROADWAY, NEW YORK.



AIR COMPRESSORS

FOR OPERATING

Pneumatic Chipping Hammers, Hoists, Casting Cleaners, Sand Blast Machines, Molding Machines and other appliances in foundry work.

COMPLETE OUTFITS FURNISHED AND INSTALLED.

For Circulars, Full Information and Prices, address . . **Clayton Air Compressor Works**

Havemeyer Building, 26 Cortlandt Street, NEW YORK.

Directory of Leading Dealers in and Manufacturers of Fire Brick

Established 1826.
Incorporated 1866.

PRESBREY STOVE LINING CO.

Manufacturers of

FIRE BRICK AND STOVE LININGS.

Office and Works, 212 Somerset Ave.,

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Established 1864.

CHAS. TAYLOR'S SONS CO,

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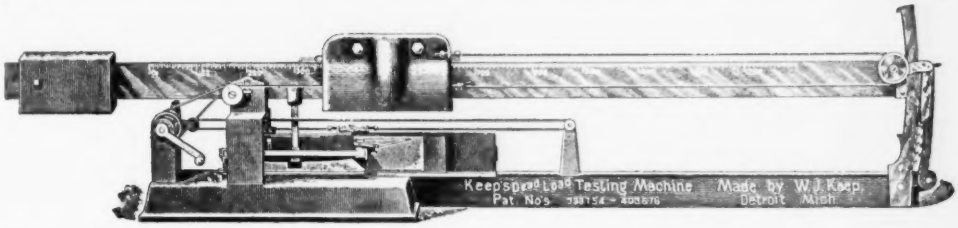
Manufacturers of

FIRE BRICK for All Purposes.

Workers of

CARTER CO., KENTUCKY, CLAYS.

MECHANICAL ANALYSIS



The Only Practical Method for . . . . MAKING CASTINGS

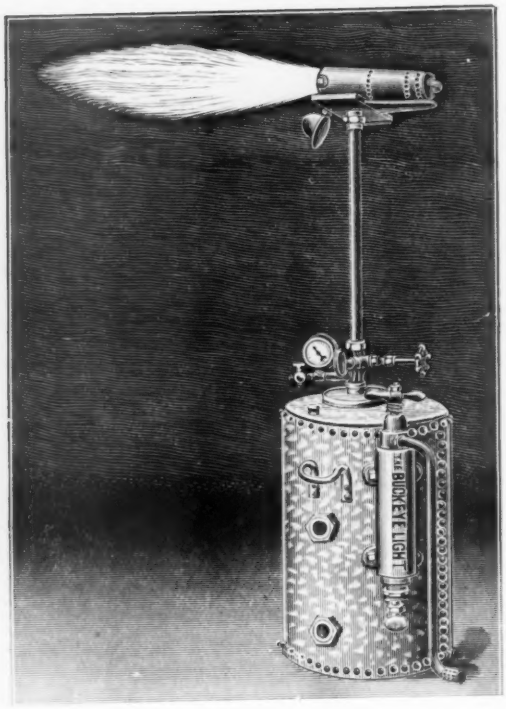
OF A DESIRED QUALITY

AT A LOW PRICE. ✻

Send for Testimonials and for Description of

W. J. KEEP, Detroit, Mich.

KEEP'S TEST APPARATUS.



There Will be a Rush

of work this winter. You won't be able to get through with it all in daylight.

We know you don't like to work after dark. Maybe you hang to the opinion that it does not pay. That depends on how you light your shop. If you make it as bright as day, your men will do as much work as in daylight. If you don't, they will certainly do less.

The **BUCKEYE LIGHT** is the only light for foundries. It is the only one that will penetrate smoke and steam.

Put it in your shop and your men will pay for it in a couple of weeks with the extra work they will do. Days are getting short. Better send us your address for booklet and prices today.

McLeod & Clark,

Sole Manufacturers,
457-463 E. Front St., CINCINNATI.

For Sale by
S. OBERMAYER CO., Chicago and Cincinnati.
J. W. PAXSON CO., Philadelphia.
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FOUNDRY MOLDING MACHINES,
STRIPPING PLATE MACHINES,
PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1870.

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES

U.S. TIN

is used in making brass and bronze castings; it makes a superior metal, sounder castings, more homogeneous in structure, richer color, better wearing metal, of higher surface lustre than alloy made with imported tin. U. S. TIN is to be used in same proportions as imported tin.

The Price is Much Lower.

The difference in price, the superiority of metal, and sounder castings should induce all users of metals to make comparative tests. We will send to responsible parties small lots of the U. S. TIN on approval, and if satisfactory, will make contracts covering a given time. Shall be pleased to correspond with all who may be interested.

THE AJAX METAL COMPANY, PHILADELPHIA, PA.

"Short Talks on Advertising."

224 pages, 123 illustrations; sent postpaid on receipt of price.

Paper binding, lithographed cover, 25 cents

Cloth and gold, gold top, uncut edges, $1.00

CHARLES AUSTIN BATES
Vanderbilt Building
NEW YORK

"Mr. Bates' Masterpiece. It is interestingly and readably written—more readable than one would believe possible on so hackneyed a subject as advertising—and it is illustrated by pictures intended to lend a humorous turn to many of the sentences in the text. For those who want a general idea of advertising principles, the book will be found valuable, and even the readers to whom its subject is more than familiar will find it an interesting companion for a leisure hour. It is full of apothegms, every one of which rings with a true note."—*Geo. P. Rowell.*

"Excellent Work."—*Buffalo Evening News.*
"Interesting and Profitable."—*Baltimore Herald.*
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"Cannot fail to prove interesting."—*Pittsburg Press.*
"Should be in the hands of every business man."—*Philadelphia Ledger.*

A VERY SMALL HOLE

in a casting will cause your customers to shrug their shoulders. Maybe if they accept it at all, it will only be after you have knocked several dollars off the price. More than half the castings are hauled to the scrap heap, not because they *are* bad, but because they *look* bad. They have the strength; they are up to specifications in everything but *looks*, and *looks* are what count, whether you are selling castings, beefsteak or furniture.

Smooth On is a preparation that improves the appearance of castings. If there are blemishes on them, fill these with **Smooth On** and smooth the whole thing over. That is the last you will hear about it. **Smooth On** will stay there 'til doomsday and nobody will ever know that it has been used. For repairing cast iron boilers, radiators or other castings that have to be steam tight, you will find it just the thing. **Smooth On** will stop the leaks and do it for all time to come, too.

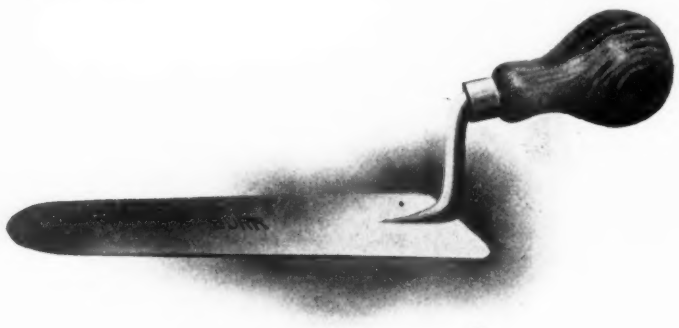
SMOOTH ON MFG. CO.,

VREELAND TOMPKINS, CHEMIST AND MANAGER.

547-549 COMMUNIPAW AVENUE, JERSEY CITY, N. J., U. S. A.

We have some printed matter for you if you will say you want it.

WE are the largest manufacturers of Molders' Tools in the world. Every first class Foundry Supply House and Hardware Store sells them.



If you want the Best Tools made, be sure and order Tools manufactured by

BURR'S DAMASCUS TOOL WORKS,

66-72 FORT STREET EAST, DETROIT, MICH.

WE PRINT
THE FOUNDRY

ALL KINDS OF PEOPLE are satisfied with the kind of *Printing* we do; satisfied with the quality; satisfied with the price. We do . . . better work at lower prices, because we are equipped with the latest and most . . modern printing machinery, all labor-saving devices, the newest type faces, and personally supervise all work turned out. Submit us your copy and we will assist you in getting up *Circulars, Catalogs, Price Lists*, etc., that will be read.

SPEAKER PRINTING COMPANY,

SPEAKER & HINES, PROPRIETORS. DETROIT, MICH.

KIRK'S Book on **"Cupola Practice"** is what you need. It tells all about Cupolas and their operation. Learn how to melt your iron right. We will send you a copy for **$3.50.**

THE FOUNDRY PUBLISHING CO., Detroit.

W. H. STEWART was the first one to introduce a **Core Compound** that met the requirements of all kinds of foundries. There has been a whole lot of imitations put on the market since then, but

STEWART'S
LIQUID CORE COMPOUND

still enjoys a larger sale than ever. It is the only Core Compound that makes a perfect core. We have some reading matter that tells why this is so. You can have same for a postal card.

W. H. STEWART, 105 John St., NEW YORK.

Manufacturer of

Patent Lap-Seal Ready Roofing.
Roof Coating.
Roof Paints and Cements.
Liquid Paints.
Shingle Stains.
Plastic Stove Brick.
Retort Cement.
Furnace Cement.

Send for Descriptive Circulars.

DO YOU MAKE LIGHT OR HEAVY

Dry Sand and Skin Dried Work?

IF SO, YOU SHOULD USE

McCORMICK'S

VULCAN BLACKING.

It makes as clear and smooth a casting as the best plumbago and better than the silver leads. Not an experiment—in use in the largest foundries. A trial will satisfy you of its value.

MADE ONLY BY

J. S. McCORMICK CO., PITTSBURG, PA.

A GOOD THING!

That's what you are missing when you fail to use **"DOME" FIRE CLAY.** One Steel Manufacturing Company has used *fifty carloads since January 1st, 1899;* another formerly used the highest grade of Pennsylvania Clay and is now using **"DOME" CLAY** *exclusively;* and so on.

Let us send you a *free sample for test,* and put you in the way of saving over 100 per cent. on your Clay bills, *sure.*

Our Cupola Blocks, Fire Brick, Molding Sand, Fire Sand, etc., are of the most substantial kind.

Our References—any Leading Manufacturer in the Northwest. *Write us!*

GARDEN CITY SAND CO.,

LONG DISTANCE PHONE, M 5102.

188 Madison Street, CHICAGO.

DIRECTORY OF LEADING PIG IRON DEALERS.

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(Limited)
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Manufacturers, Importers
and Dealers in
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C. L. PEIRSON & CO.
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Foundry Mixtures a Specialty.
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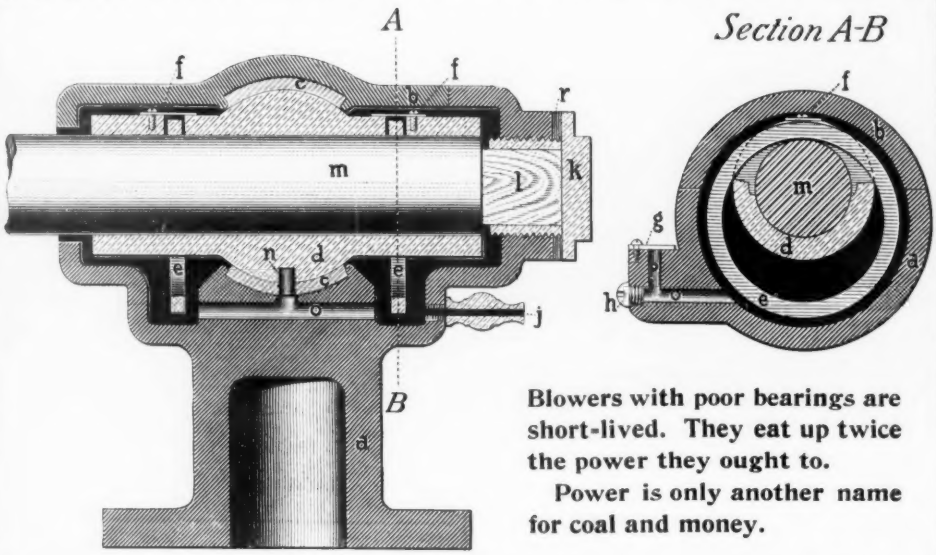
ST. LOUIS
PITTSBURG, CLEVELAND.

STEVENSON, FIELD & CO.
PIG IRON and COKE.
Columbus, O. St. Louis, Mo

The bearings determine the life of a Blower and also the cost of operating it.



Blowers with poor bearings are short-lived. They eat up twice the power they ought to.

Power is only another name for coal and money.

IN order that foundrymen in general may become better acquainted with our method of constructing bearings for the **Poole Pressure Blower,** we show herewith two views of same.

a—Pedestal.
b—Cap.
c—Babbitt.
d—Bronze-sleeve.
e—Brass Oiling Rings.
f—Ring Retainer.
g—Oil-hole Cap.
h—Oil-Hole Plug.
j—Oil Drainage Cock.
k—Bronze Adjusting Nut.
l—Lignum-Vitae Plug.
m—Blower Shaft.
n—Retaining Pin.
o-p—Oil Duct.
r—Adjusting Washers.

With such a construction of bearings, the **Poole Pressure Blower** will, with ordinary care, last indefinitely.

The other parts of the **Poole Pressure Blower** are constructed with equal care. We show this in our regular catalogue, which is yours for a postal card.

Manufactured and Sold by **J. B. & J. M. CORNELL,** 26th St. and 11th Ave. NEW YORK CITY.

LISTEN!

You have never paid the attention to your Brass Foundry that it deserves.

You've gathered together a few pieces of scrap iron, thrown in a few fire brick and called this combination a brass furnace.

Yon have melted brass with this arrangement, but you've not done so in an economical manner.

In the first place, you have wasted coke in melting. In the second place, you have lost metal through the happy-go-lucky construction of . . . your furnaces.

You have produced cuss-words galore with your sticking grates and warping covers. The *Millett* people (the same ones who make the *Millett Core Oven*—the world-beater) have brought out a brass furnace, and it, too, is making a record.

The *Millett Brass Furnace* does away with your old troubles. It stops waste of fuel and material. It gives you a chance to keep even with the other fellow, even if copper and tin is rather high. We have just printed some booklets describing the *Millett Brass Furnace* in detail. If you are interested in this part of the foundry business, you will want to read one of these. A postal card brings it.

Our Ovens and Furnaces are on exhibition in the show rooms of the J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Cincinnati and Chicago.

Makers of the MILLETT CORE OVEN and the MILLETT BRASS FURNACE.

MILLETT CORE OVEN CO.,

BRIGHTWOOD, MASS.

$50.00 for Your Estimate

IF CORRECT.

QUITE a wide difference of opinion exists among those interested in pig iron regarding the probable output during this year. To encourage our friends to obtain accurate information and to form an estimate, **we offer Fifty Dollars** to the one who will, during the month of October, 1899, send us an estimate of total production of pig iron in the United States for year ending December 31st, 1899, that shall prove to be nearest the actual output, as shown by report of American Iron & Steel Association.

If several estimates are correct or nearest correct, the money will be equally divided between them.

All Estimates are to be sent to our Cincinnati Office.

PIG IRON.

THE SOUTHERN LEADERS.

The extreme depression in pig iron forced several favorite brands out of the market, because furnace owners could not pay prices demanded for their choice supply of ore and coke. The present revival enables them to operate again and it is a pleasure to offer

TALLADEGA **VANDERBILT**

TRUSSVILLE **WILLIAMSON**

The plants are not large and the combined production will not cut much figure in the year's output. Each one, however, will be run under the close, personal care of the owner, and the customers will be assured of the highest standard in quality and grading. Prices no higher than for standard Southern brands. Write for quotations.

Rogers, Brown & Co.,

CINCINNATI NEW YORK CHICAGO BUFFALO
PHILADELPHIA PITTSBURGH CLEVELAND BOSTON
ST. LOUIS BIRMINGHAM

This is What We Have to Offer You—

THE BEST AT LOWEST PRICES.

Shovels
Riddles
Brushes
Bellows
Molders' Tools
Chaplets
Crucibles
Pattern Letters
Hay Rope
Coke Forks
Mallets
Pattern Dressing
Buckets
Brass Sand
Etc., Etc.

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Pure East India Plumbago
American Graphite
Sea Coal or Bituminous Facing
Heavy Machinery Facing
Reliance Dry Sand Blacking
Core Compound
Peerless Core Wash
Talc
Perfect Core Wash
XXX Heavy Stove Plate
and
National Return Facing
Fire Brick and Cupola Blocks

THE S. OBERMAYER CO.

CINCINNATI, OHIO. ✦ CHICAGO, ILLINOIS.

SOMETHING NEW and SOMETHING GOOD.

Please don't throw away a large casting on account of a small imperfection or a "blow hole."

WE CAN SAVE THE CASTING.
WE CAN SAVE YOU TIME.
WE CAN SAVE YOU MONEY.
WE CAN SAVE YOU TROUBLE.
WE CAN SAVE YOUR SOUL,
(by preventing your using lots of bad words.)

AND ONLY BY USING

NATIONAL IRON FILLER

which is the same color as the casting and gets hard as the iron, and sets in less than 20 hours and remains as hard and tough as the iron itself.

PRICE, 25 CENTS PER POUND.

NO MORE, NO LESS. PUT UP IN 12-POUND CANS.

Full Directions for Using Given With Each Shipment.

MANUFACTURED ONLY BY

THE S. OBERMAYER CO.

CINCINNATI. CHICAGO.

"Everything you Need in Your Foundry."

SEND FOR CATALOGUES.

RECENTLY, while asking a Negro Cupola Tender what kind of a lining he liked best, he told us (and we repeat it in his own words), "Ise like dem big blocks sittin' over dere." On examining them we were agreeably surprised to discover that they were our **OBERMAYER BLOCK, Size 12x6x6.** We asked him why, to which he replied: "Dey fit dis yere cupola, an' I can put dem in quicker dan any brick we ever had in dis place befo." We then asked how they stood the fire. He replied: "Well, boss, we got dem blocks in May an' I lined dat cupola on de next Sunday faster dan I ever did befo, an' accordin' to my best jedgment, it am good for another year."

We inquired what he used for a daub and found he was using our **Fire Sand** and **Clay,** in the proportion of two to one. But in regard to this, he said: "Ise has to be mighty keerful about puttin' that stuff on, 'cause it don't come off with the slag like clay does and if too much am put on, it would make de lining too thick. It seems to stick good, so Ise put it on pretty thin, and Ise tell you, boss, dat stuff saves the lining."

This is the opinion of a man who has the actual experience, and while he does not present it as his principals might, his experience speaks well for our block.

There are three points one must consider in producing a Cupola Lining—expansion, contraction and friction. We claim to have a block that will overcome all trouble in this respect, and we guarantee it to do so. If it does not meet these requirements, we agree to replace same free of charge. We make sizes to fit any Cupola, doing away with the necessity of tightening a joint here and widening one there to make the circle. They do not cost any more than a good block of similar size, and very little more than a poor one.

Write us for prices and any information you want regarding any kind or shape.

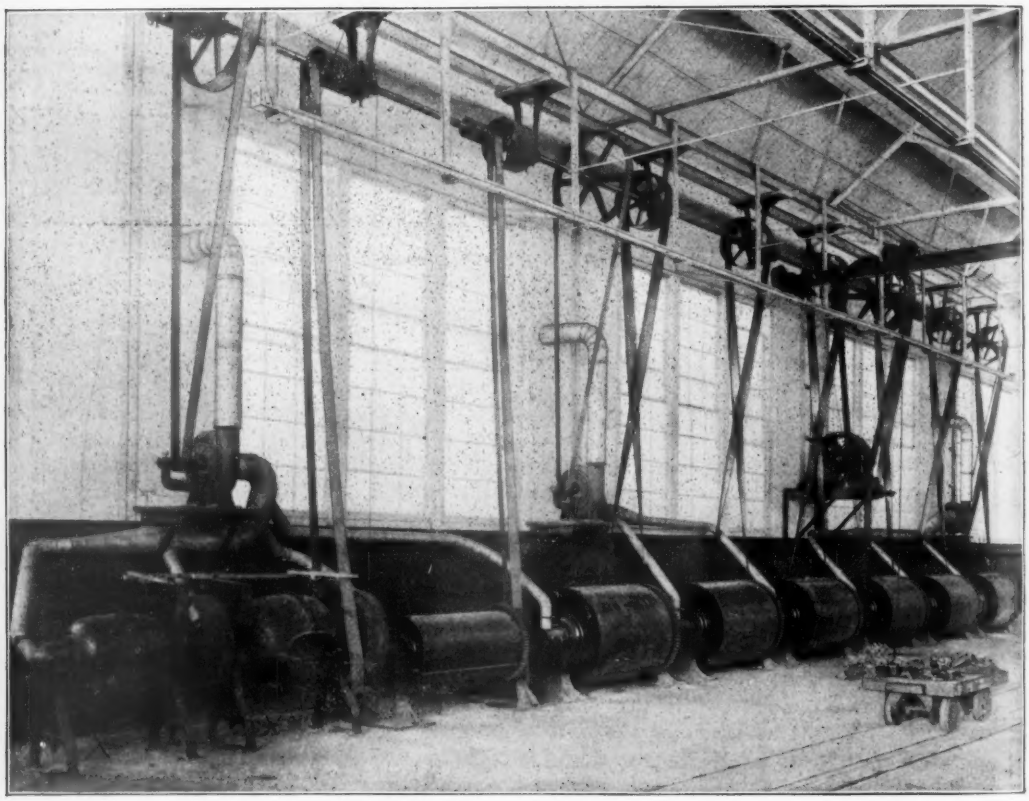
We Make Anything in the Way of Fire Brick.

THE S. OBERMAYER CO.

CINCINNATI. Works—OAK HILL. CHICAGO.

Paxson Exhaust Rumblers

MADE OF STEEL.



No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors. We also supplied them with two egg-shaped Rumblers, as shown in the cut.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

NEW CATALOG No. 11.

The Most Complete Ever Published in the English Language on Foundry Equipment and Supplies. Who Wants One

?

J. W. PAXSON CO. 1021 NORTH DELAWARE AVE., PHILADELPHIA, PA., U. S. A.

Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.

CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

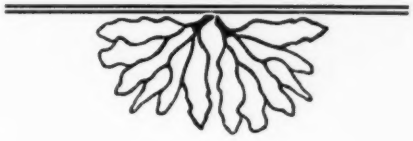
Joseph Dixon Crucible Co.

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537=39 *West 27th St.,*
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

Machine Work or hand work, it is all the same; good facing is required, and the **Cleveland Facing Mill Co.** turns out this material to suit any and all classes of work. The **C. F. M. Founders Perfect Wash** is the stand-by of all foundries having a reputation for fine work. It might possibly settle some of the grumbling you occasionally hear from your customers.

The **Perfection Core Box.** Have you examined it? If not, say so, and we will saw off a piece for you as a sample. It is one of the few real good things put on the market in the last number of years. You may be able to get along with fewer pattern-makers by adopting it.

We have the best of shipping facilities and can fill your orders promptly. Our new Catalogue is just off the press. Do you want one?

The Cleveland Facing Mill Co.

FRANK H. CHAMBERLIN, PROPRIETOR.

CLEVELAND, OHIO.

M. M. COCHRAN, PRES.
J. R. LAUGHREY, VICE-PRES.

JNO. H. WURTZ, SECY.-TREAS.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. **5000 Tons Daily Capacity.**

300 30-TON COAL CARS — 50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

What's a "Steamhydraulicker?"

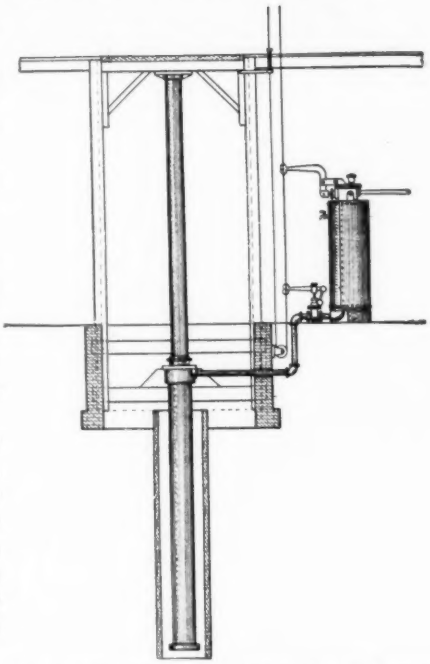
A man who never has any trouble with his elevator, would be one answer to the conundrum.

A "Steamhydraulicker," however, is a man who knows Ridgway, of Coatsville, and uses his wonderful Steam Hydraulic machines, both Elevators and Cranes.

"Steamdydraulickers" are becoming very numerous and are to be found everywhere that steam boilers grow.

You just ought to see our order book—especially the elevator one. If you did, you would realize that we have struck that old historic "Long Felt Want."

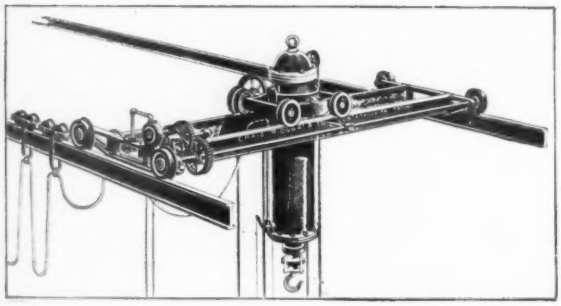
The fact is, the Ridgway Elevator is by so great odds the best device ever invented for "histin'" things, that a man has only to know about it and he is sure to get it.



For example, we had a man to see us the other day who got a Ridgway Elevator for his works a year or two ago. Recently his shop was taken over by one of the trusts and he is general manager or something. At any rate, he is going to equip all the many plants of this trust with Ridgway Elevators like in his own old shop, and he begins by placing his order for an equipment of the largest one of their whole 30 shops.

We might cite others if need were. What we want is that you should know the Ridgway Elevator. If you know it, you'll soon be a **"Steamhydraulicker"** like the rest of them—and nobody will shout "Ridgway" any louder than you!

HYDRAULIC AIR HOISTS



Of course Ridgway Oil Governed Air Hoists cost more than other air hoists. We've always said so. Can build three plain hoists while making one oil governed hoist. Whether or not they are worth the difference in price you are to be the judge, by taking the Hoist, hang it up and work it. If you don't feel like taking your hat off to it, send it back.

THE RIDGWAY CRANE,

So dear to the hearts of all "Steamhydraulickers."

CRAIG RIDGWAY & SON, COATESVILLE, PA.

EUROPEAN AGENT,

CHAS. G. ECKSTEIN, 16 Spandauerstr., Berlin, Germany.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.

ECONOMICAL.

EXPEDITIOUS.

NOTE. — The old-fashioned method of sifting sand has been to a large degree superseded in modern foundries by the Superior Centrifugal Method, and the machine illustrated herewith is a real labor saver.

Correspondence Is Solicited.

Over 15,000 in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

ROSS-MEEHAN FOUNDRY CO.
CHATTANOOGA, TENN., May 5, 1896.

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y, & Treas.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

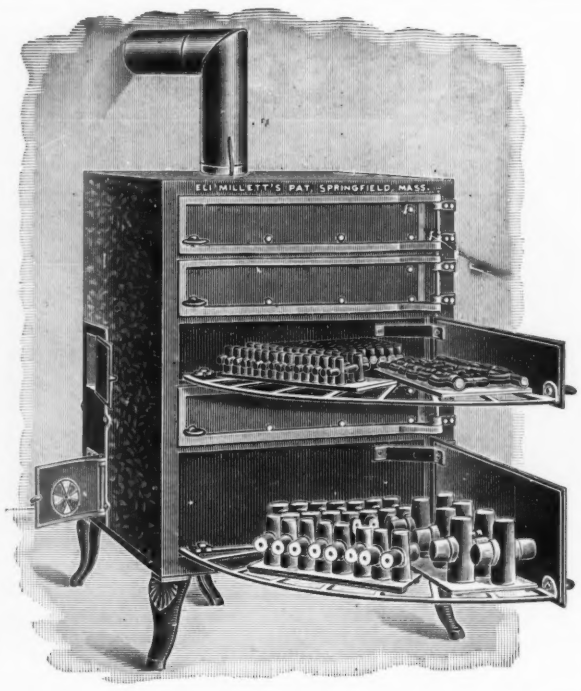
We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO. ILL.

44-46 WASHINGTON STREET, NEW YORK.
P. A. BRAWNER, JR., Sec'y. & Treas.



This is the Portable Style of the

Millett Core Oven

OVENS of this design were at first built to satisfy brass and iron foundries doing light work exclusively. The first thing we knew the foundries doing heavy work wanted these ovens to take care of their smaller cores. Every oven we built advertised itself, with the result that we have been kept busy all these years turning them out. It is a poor idea to dry all sizes of cores in one oven. Can't be done satisfactorily. With your small cores in this oven, where they can be baked and taken out at will, without interfering with but one shelf at a time, your large cores can be left alone. You don't have to cool off your big oven when you have the **Millett.**

So many of these ovens are in use in all parts of the country, that it is likely we can refer you to one in your immediate vicinity. All we ask is that you go and see it. You will do the rest.

These Ovens can be seen in the Show Rooms of THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Cincinnati and Chicago.

Millett Core Oven Co., Brightwood, Mass.

LISTEN!

You have never paid the attention to your Brass Foundry that it deserves. You've gathered together a few . . pieces of scrap iron, thrown in a few fire brick and called this combination . a . brass furnace.

You have melted . . brass with this arrangement, but you've not done so in an economical manner.

In the first place, you have wasted time and material in keeping your old brick piers in sepair. In the second place, you have wasted time in melting, by having the draft obstructed by these old brick piers. The *Millett* people (the same ones who make the *Millett Core Oven* — the world-beater) have brought out a brass furnace, and it, too, is making a record. The *Millett Brass Furnace* does away with your old troubles. It stops waste of material. It gives you a chance to keep even with the other fellow, even if copper and tin is rather high.

We have just printed some booklets describing the *Millett Brass Furnace* in detail. If you are interested in this part of the foundry business, you will want to read one of these. A postal card brings it.

Makers of the MILLETT CORE OVEN and the MILLETT BRASS FURNACE.

MILLETT CORE OVEN CO.

BRIGHTWOOD, MASS.

Carrying Iron

is not the only thing that the **Coburn Trolley Track** will do. Did you ever stop to think that wheelbarrows and trucks are clumsy things for this purpose?

When you put the **Coburn Trolley Track** in your foundry, lay a stub track to your cleaning room, put in a switch, and there you are getting your castings from the foundry without being in anybody's way or interfering with anyone's work.

At the same time, you might lay another piece of track to your sand bins—won't cost you hardly anything. When you see how smoothly you get things in and out of your shop, you will wish you had taken our advice sooner and put in that trolley track years ago.

A rough sketch of your shop will enable us to tell you just about what we can do for you. Do we get it?

Coburn Trolley Track Mfg. Co.

HOLYOKE, MASS.

ROOTS'
BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS

BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

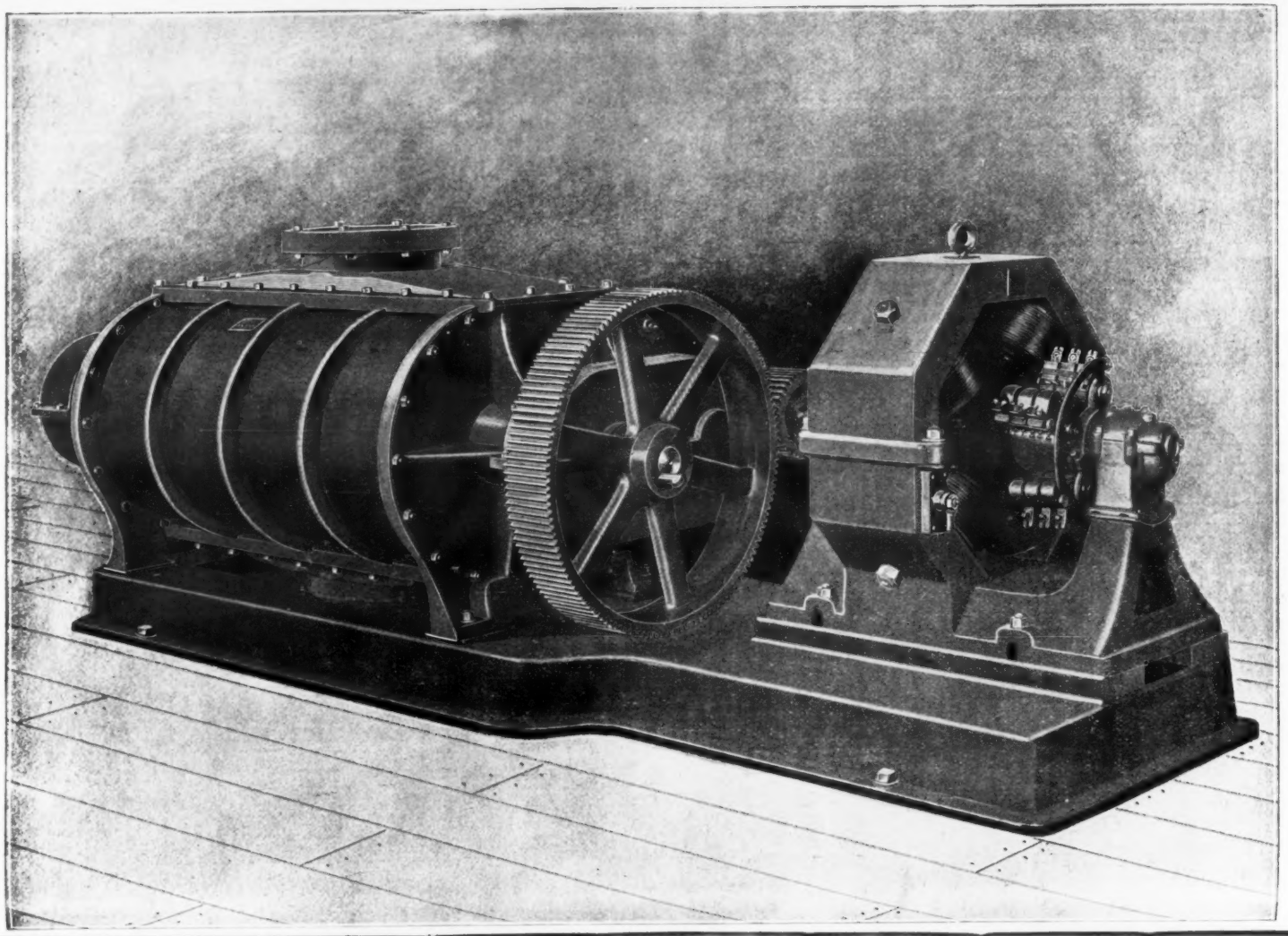
THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

C. H. BRADLEY, JR. & CO.,
Vandergrift Building,
PITTSBURG, PA.

EDMUND A. FORDYCE,
156 Lake Street,
CHICAGO, ILL.



You are going to be busy

this winter. All wise men are making that prophecy. You know you will need more pig iron—been trying to get it before this, probably. You have tried to arrange for an extra supply of coke—must get it some way or another. Have you thought anything about an extra car or two of molding sand? The more pig iron you melt, the more molding sand you will need. Molders won't do good work with rotten sand—never did.

We are selling lots of **Zanesville** Sand these days. We have sold a great deal of it for years. It comes in all grades, suits any work you have got, and, what is of further interest to you, it comes at a reasonable figure.

If you care to drop that fancy-named sand you are using now, we will produce its equal in **Zanesville,** if you will tell us just what kind of work you want it for.

Along with high-priced molding sand, some foundries have got into the habit of using high-priced fire clay. Our **Crude Plastic Fire Clay** isn't done up in tinfoil, but is an A1 article, just the same. Along with our **Bank Fire Sand,** it makes a splendid daubing for cupola or ladle use.

If you doubt our ability to give you **Zanesville Molding Sand, Fire Clay** and **Fire Sand** at the right price, drop us a card. We will then tell you what these things will cost you on your own sidetrack.

E. M. AYERS,

H. S. VROOMAN, **Market Block, ZANESVILLE, OHIO.**

Western Agent, 220 W. 20th St., CHICAGO.

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
CINCINNATI. ST. LOUIS.
Agencies,
Chicago, Detroit, New York,
Philadelphia. Pittsburg.

DAYTON COAL & IRON CO.
(Limited)
PIG IRON,
Dayton, Tenn. Cincinnati, Ohio.

DECAMP BROS. & YULE,
Pig Iron and Coke.
Sole Agents McNair & DeCamp's
MISSOURI
MALLEABLE BESSEMER PIG IRON.
Fullerton Building, St. Louis.

THE DOMHOFF & JOYCE CO.
PIG IRON and COKE.
702 Fisher Building,
CHICAGO. CINCINNATI.

F. A. GOODRICH & CO.
Incorporated
PIG IRON, STEEL, COKE, ETC.
Detroit, Mich.

M. A. HANNA & CO.
COAL, IRON ORE
and PIG IRON.
Cleveland, Ohio.

THOMAS A. MACK,
PIG IRON.
Cincinnati, - - Ohio.

COLUMBUS, O. CHICAGO, ILLS.

MILLER, WAGONER, FIESER & COMPANY.
PITTSBURGH, PA.

J. J. MOHR.
Foundry, Forge, Charcoal and Bessemer
PIG IRON,
Bullitt Building, Philadelphia, Pa.

PICKANDS, BROWN & CO.
Manufacturers, Importers and Dealers in
PIG IRON AND IRON ORE.
Rookery Building, CHICAGO.

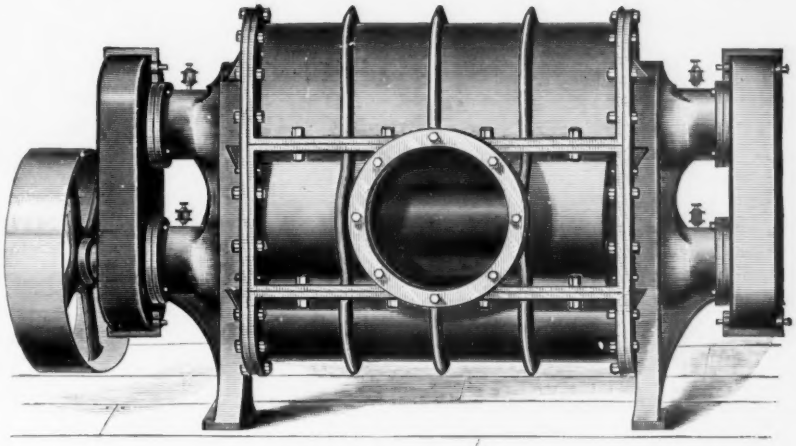
C. L. PEIRSON & CO.
PIG IRON and COKE.
Foundry Mixtures a Specialty.
BOSTON. NEW YORK

PILLING & CRANE.
PIG IRON and COKE,
Carnegie Building,
PITTSBURG, PA.
Girard Building,
PHILADELPHIA, PA.

ROGERS, BROWN & CO.
CINCINNATI, CHICAGO,
BUFFALO,
PHILADELPHIA, NEW YORK,
ST. LOUIS
PITTSBURG, CLEVELAND.

STEVENSON, FIELD & CO.
PIG IRON and COKE,
Columbus, O. St. Louis, Mo

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

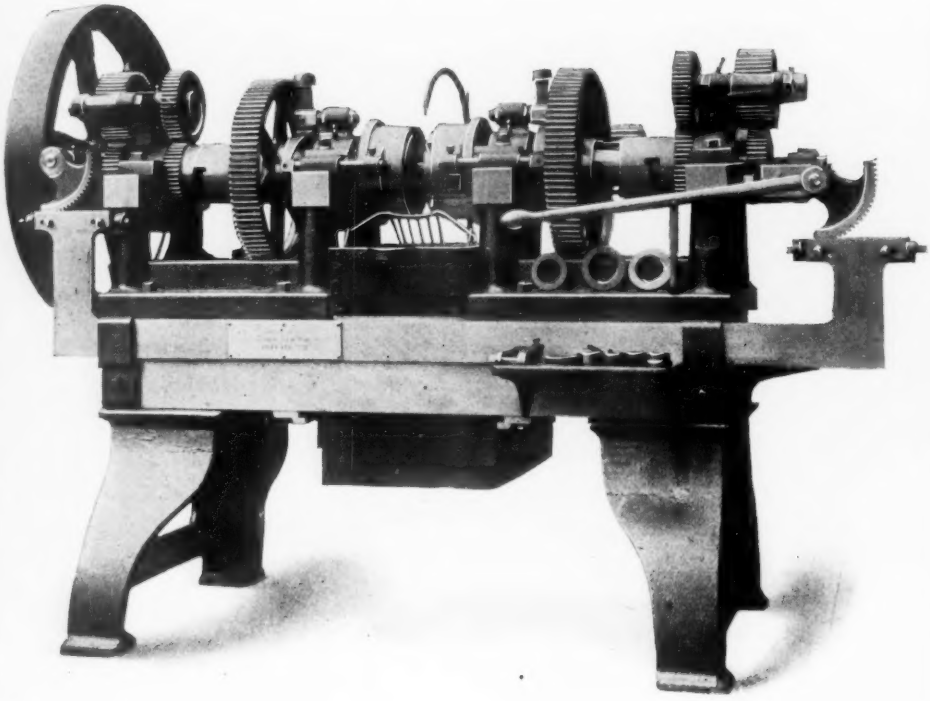
The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: Frazer & Chalmers, Inc. CHICAGO, ILL., and BRANCH HOUSES

Radiator Appliances ..



We are prepared to submit estimates and furnish promptly machinery and equipments of all kinds for the manufacture of Radiators of every description, including **Patterns, Flasks, Core Boxes, Nipple Cutting Machines, Automatic Reaming and Tapping, Assembling and Testing Machinery.**

We also Design and Build Special Machinery for Any Required Purpose.

Twenty Years' Experience in
Practical Radiator Manufacture.

O. BRYANT, SONS & CO., 1453 NIAGARA STREET, BUFFALO, N. Y.

BUSINESS IS BUSINESS.

It takes money to pay for advertising.

An article cannot be advertised and kept before the public unless it possesses merit.

When we tell you that **Smooth-On** has been advertised regularly in THE FOUNDRY for nearly five years, you will understand that its qualities are of the lasting kind.

Foundrymen are a very conservative class, but when they do find a good thing, how they do stick to it.

And why should they not stick to **Smooth-On** when **Smooth-On** sticks to their defective castings so that even a sledge hammer fails to separate it.

Lots of cheap, so-called iron fillers on the market, that will stay in a casting about as long as putty and then give you away the minute some one gives the casting a rap.

Smooth-On is the only perfect preparation for curing defects in castings, whether they are blow or sand holes, or leaks caused by dirty iron.

The chemical reaction which takes place after its application, renders it a part of the casting itself and the "doctored" portion may be finished the same as any other part of the casting.

Write for a Sample Can of **Smooth-On** to-day and see what it will do. You will kick yourself for not having done this sooner.

SMOOTH-ON MFG. CO.,

VREELAND TOMPKINS, CHEMIST AND MANAGER.

547-549 COMMUNIPAW AVENUE, JERSEY CITY, N. J., U. S. A.

Directory of Leading Dealers in and Manufacturers of Fire Brick

Established 1856.

HENRY MAURER & SON,

Manufacturers of

FIRE BRICK of All Shapes and Sizes.

Cupola Linings, Etc.

420 E. 23rd Street, NEW YORK.

Works—Maurer, N J.

FIRE BRICK for All Purposes,

Extra quality Fire Brick suitable for Iron Trade. Largest Stock in the State, all Shapes and Sizes.

Kiln Brick, Cupola and Furnace Blocks a Specialty.

Finest Quality Fire Mortar and Crude Clay. Shipments promptly anywhere. Send blue prints for our prices on Special Work.

STATEN ISLAND CLAY CO.,

WOODBRIDGE, N. J.

Established 1826.
Incorporated 1866.

PRESBREY STOVE LINING CO.

Manufacturers of

FIRE BRICK AND STOVE LININGS,

Office and Works, 212 Somerset Ave.,

TAUNTON, MASS.

Established 1864.

CHAS. TAYLOR'S SONS CO.,

CINCINNATI, OHIO.

Manufacturers of

FIRE BRICK for All Purposes.

Workers of

CARTER CO., KENTUCKY, CLAYS.

Telephone, Canal 267.

FIRE BRICK and MOLDING SAND.

All Grades and Shapes of Fire Brick and Cupola Block.

H. S. VROOMAN,

220 West Twentieth Street.

CHICAGO.

If Quality

IS DESIRED, USE

Our

Crucibles.

McCULLOUGH-DALZELL COMPANY

PITTSBURG, PA.

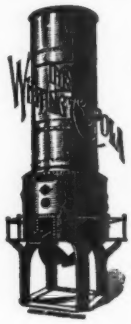
WRITE FOR CATALOGUE.

Whiting Foundry Equipment Co.

GENERAL OFFICE AND WORKS; HARVEY, ILL., U.S.A. (CHICAGO SUBURB.)

CHICAGO OFFICE: 1543 MARQUETTE BUILDING.

CUPOLAS
TUMBLERS
LADLES
SIFTERS



AIR HOISTS
RECEIVERS
TURNTABLES
TRUCKS, ETC.

Engineers and Designers of Complete Plants for the Manufacture of

CAST IRON CHILLED CAR WHEELS

(WHITING PATENT SYSTEM.)

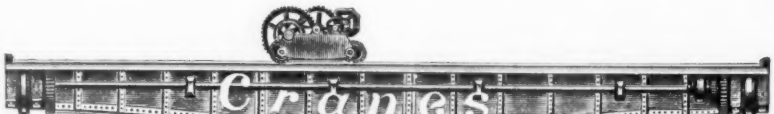
CAST IRON PIPE

(GAS and WATER.)

MALLEABLE AND STEEL CASTINGS

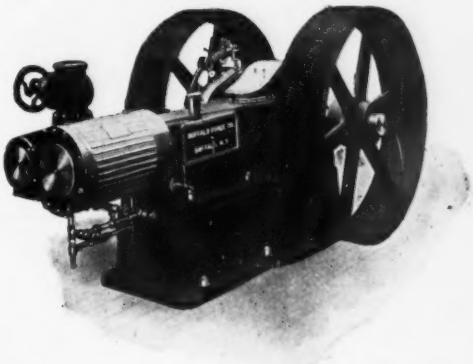
OUR SPECIALTY—

ALL TYPES OF CRANES.

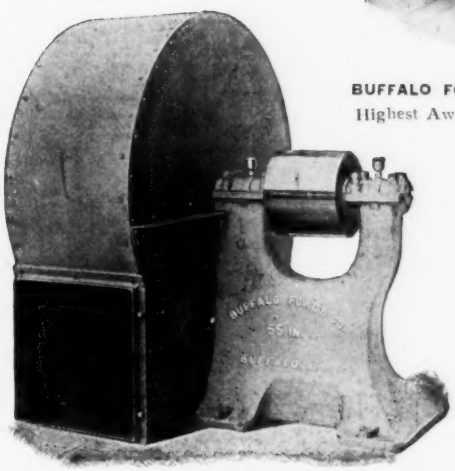


Electric, Compressed Air and Hand Power.

EXPORT BUSINESS SOLICITED. SEND FOR CATALOGS.



BUFFALO FORGE CO., AUTOMATIC ENGINE.
Highest Award and Gold Medal at Omaha, 1898.



BUFFALO TUMBLING BARREL EXHAUSTER

Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

Send for details.

Our 400 Page Catalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

◆◆

Buffalo Forge Company,

BUFFALO, N. Y.

BUFFALO CUPOLA BLOWER.

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demands that a Journal should treat every advertiser alike . .

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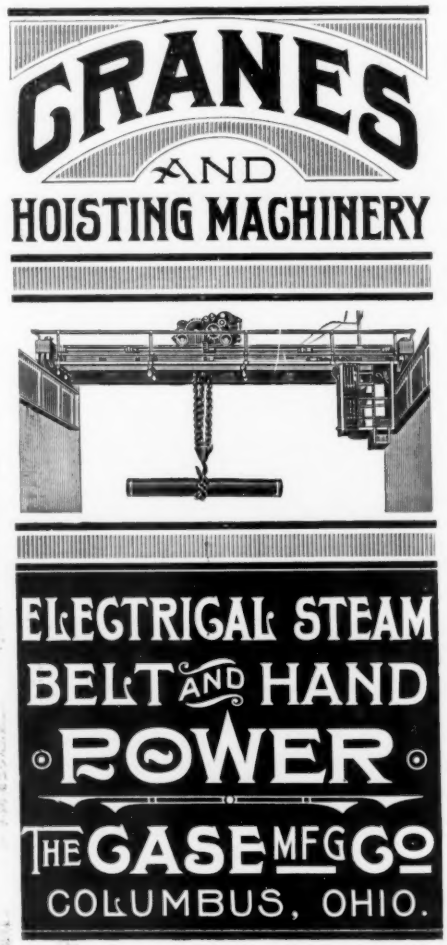
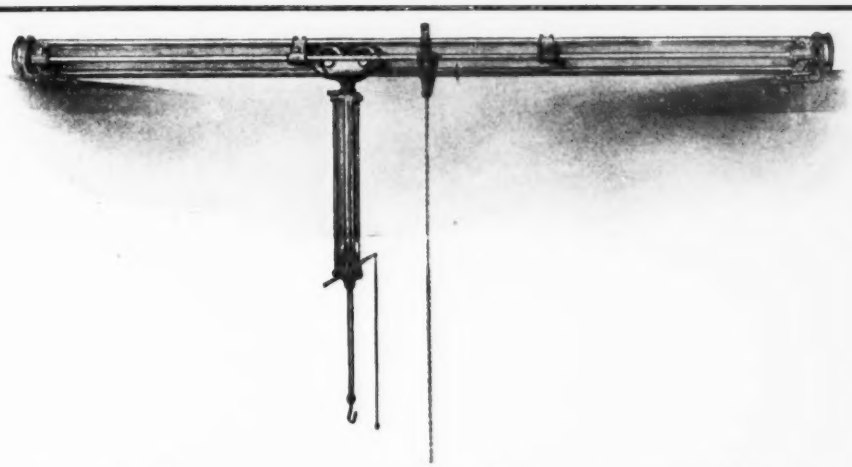
has but one rate. No reduction to Advertising Agencies.

Full Page, per month,	-	**$25.00**
Half " "	- -	**15.00**
Quarter Page, "	- -	**8.50**





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An excellent crane for light, quick work. The most efficient and lowest in price for work of moderate weight and for moderate lifts. Hoist is safe, quick and easily operated.

CRANES. SEND FOR CATALOG AIR HOISTS.

NORTHERN ENGINEERING WORKS,

4 CHENE STREET, DETROIT, MICH.

ELECTRIC, COMPRESSED AIR, STEAM AND HAND POWER CRANES.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

MANUFACTURERS OF

"CLINTON" AND "HECTOR"

INSPECTED FOUNDRY IRONS . . . . .

ALSO

Sole Factors for DUNBAR STRONG IRON

In New York and New England.

FURNACES, PITTSBURGH.

NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

E. D. WHITE, President. A. H. GUTKES, Vice-Pres.
H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works

T. K. BRICK, 1854. E. D. WHITE & CO., 1867.

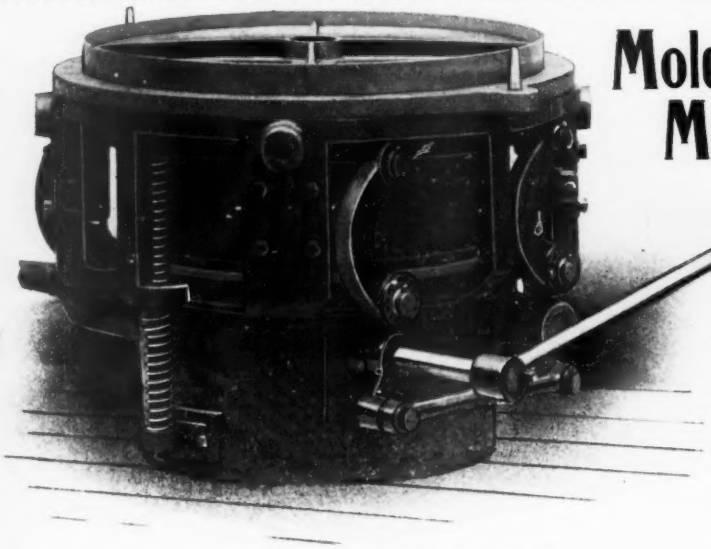
INCORPORATED 1893.

CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

88 Van Dyke Street, BROOKLYN, N. Y. CITY.



Molding Machines

of this type from 18 ins. to 120 ins. in dia. increasing 2 ins. to the size, with draws of 6 or 8 inches.

MANUFACTURED BY

HENRY E. PRIDMORE, S. E. Cor. Nineteenth and Rockwell Sts. CHICAGO, ILL.

PRIDMORE MOLDING MACHINE EUROPEAN AGENCY,
30 Victoria Street, LONDON, S. W., ENGLAND.

THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)
CLEVELAND, OHIO

You Want a Lift, do You?

Hey there, Mike; give this man a hand. Up you go; put a wedge behind, so she won't rock. Good lift, too, for a flat cope. Now suppose you should strike a snag? A real bad job. You would want another lift. You would have to pump somebody for information and might give yourself away. Why not avoid the danger of appearing as an ignoramus by getting your lifts from **THE FOUNDRY?** Continuous service for a **Dollar a Year.**

GET IT

Bargains.

One **Colliau Type Cupola,** melting capacity about ten tons per hour.

One **No. 3 Root Blower,** direct connected on sub-base to 5½x7 **New York Safety Steam Power Co. Vertical Engine;** in first-class condition.

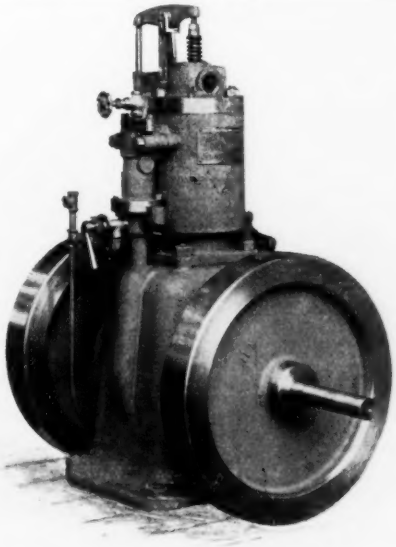
One **5-ton Yale & Towne Steam Jib Crane,** 16-foot swing; power hoisting and traversing; two speeds.

One **Reynolds Molding Press.**

One **Buckton Radial Drill,** 6-foot swing; a heavy tool suitable for rough work.

One **Board Lift** for drop forging; practically new.

Pratt & Letchworth Company,
BUFFALO, N. Y.



PEERLESS GAS ENGINE.

It is adapted perfectly to the duty of driving isolated machinery—Blowers, Tumblers, Elevators, etc.; 2, 4, 6, 8 and 10 H. P.

NORTHERN ENGINEERING WORKS,
4 CHENE STREET, DETROIT, MICH.

If your draft is deficient
MECHANICAL DRAFT
will help you

If you want to burn cheaper fuel
MECHANICAL DRAFT
will help you

If you want to increase your boiler capacity
MECHANICAL DRAFT
will help you

If you want to utilize the waste heat of the flue gases
MECHANICAL DRAFT
will help you

If you want your boilers to instantly respond to sudden demands for more steam
MECHANICAL DRAFT
will help you

If you want to save from 60 to 80 per cent. of the cost of a chimney
MECHANICAL DRAFT
will help you

If you want to know more about
MECHANICAL DRAFT
write to

B. F. STURTEVANT CO.
BOSTON, MASS.,
and ask for Catalogue No. 111

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GLUTROSE
CORE COMPOUND

Used in the Penna. R. R. foundries and other first-class foundries throughout the United States and Europe.

NO BLOWN CASTINGS.

Makes first-class Radiator Cores without Rods.

Send for Samples and Testimonials.

AMERICAN GLUTROSE WORKS
Penn Mutual Insurance Building,
PHILADELPHIA.

YOUR IRON CONTRACTS

In making your contracts for 1899 for Lake Superior Charcoal Pig Iron, it would do no harm to take up the question of

"PIONEER,"
"ANTRIM,"
"ELK RAPIDS."

These three brands have given satisfaction in car and malleable work for years in the past and will continue to do so for years to come.

Superior Charcoal Iron Co

911, 912, 913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

Admiral Dewey

IS ONE OF THE BEST DRESSED MEN IN THE . . UNITED STATES

IF HE WENT ABOUT LOOKING LIKE THAT

HE WOULDN'T BE SO POPULAR . . . . . .

Are You Particular

ABOUT THE APPEARANCE OF YOUR . . . . . .

PRINTING

OR does it just slouch away into the waste baskets? We have ink, paper and type of the very latest fashions and some original ideas, but whether the ideas are yours or ours, let us agree to send them out decently clothed. We will be pleased to take your measure for anything to be printed

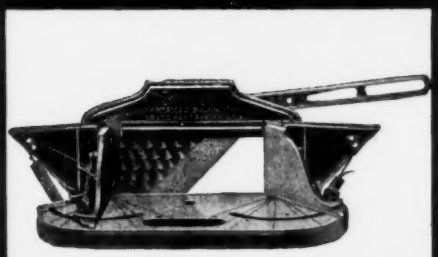
SPEAKER PRINTING COMPANY

SPEAKER & HINES, Proprietors

33-35 Larned Street W., DETROIT, MICH

WE PRINT "THE FOUNDRY."

OLIVER WOOD TRIMMERS



Probably in these good times you can get along without an Oliver Wood Trimmer. You can't make as much money, though. Perhaps you think YOUR work does not require an Oliver Wood Trimmer. We believe that we can prove to you that it does. Won't you give us a chance?

Every time your pattern-maker makes a joint by hand; your carpenter does a piece of work; you make flasks, repair patterns, etc., this machine will save you lots of money.

This No. 0 style is valuable yet inexpensive.

Your request will bring our Oliver Wood Trimmer book and all the information you desire.

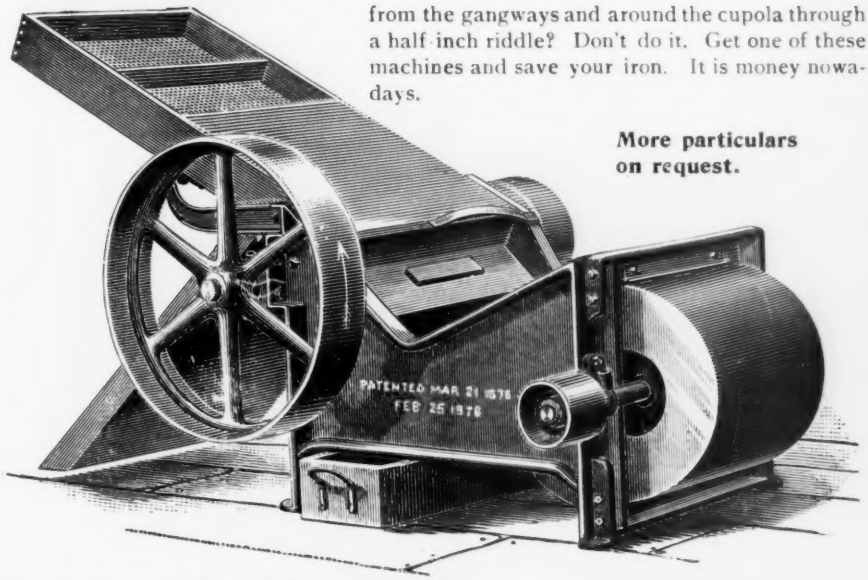
AMERICAN MACHINERY CO.
GRAND RAPIDS, MICH.

SAVE
TIME AND MONEY ON
PATTERN WORK

Riddling Your Stuff

from the gangways and around the cupola through a half-inch riddle? Don't do it. Get one of these machines and save your iron. It is money nowadays.

More particulars on request.



Audubon Machine Works, **New Haven, Conn.**

If you want your building effectively heated

THE STURTEVANT SYSTEM

will do it

If you want it thoroughly ventilated at the same time

THE STURTEVANT SYSTEM

will do it

If you want to utilize your exhaust steam

THE STURTEVANT SYSTEM

will do it

If you want to eliminate all direct steam pipe

THE STURTEVANT SYSTEM

will do it

If you want to cool and ventilate your building in summer

THE STURTEVANT SYSTEM

will do it

If you want to centralize your entire heating plant and place it under one man's control

THE STURTEVANT SYSTEM

will do it

If you want to know all about

THE STURTEVANT SYSTEM

of Heating and Ventilation by a forced Circulation of Warm Air, send for Catalogue No. 34.

B. F. STURTEVANT CO.
BOSTON, MASS.

New York Philadelphia
Chicago London

(a)

FOX TRIMMERS

REDUCE THE COST OF PATTERNS

10 SIZES Now Made.

Over 11,000 Sold.

PRICE, $12.00 and upwards, according to size.

OUR No. 8F. THE LATEST AND LARGEST

Cuts 8" high or 24" long. Bed (24"x40") swivels on column.

BUY OF THE ORIGINAL MANUFACTURERS.

Let us send you one to try, THEN if you don't want it, return it. That's

OUR STANDING OFFER. Why Not Order at Once?

Write for Catalogue. Also remember our **Machine Tools, New Hand Miller and High Speed Drills.**

THE FOX MACHINE CO. 85[illegible] N. Front Street, GRAND RAPIDS, MICH.

Eberhardt's Patented Sprue or Gate Cutter

Dear Sir:—The machine fills the bill; am just delighted with it. Yours truly, Maryland Brass & Metal Works, Baltimore, Md.

Price Low

AGENTS,

Manning, Maxwell & Moore, New York.

U. Baird Machinery Company, Pittsburgh, Pa.

Marshall & Huschart Machy. Co. Chicago and Cleveland.

Send to

GOULD & EBERHARDT, NEWARK, N. J.

Heyl & Patterson

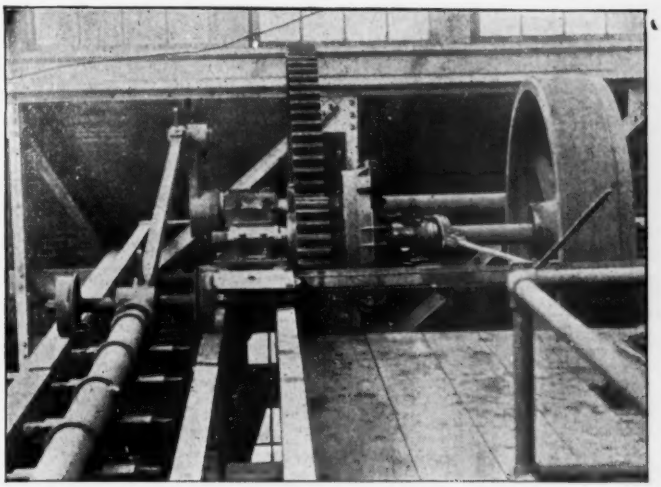
ENGINEERS AND CONTRACTORS,
PITTSBURG, PA.

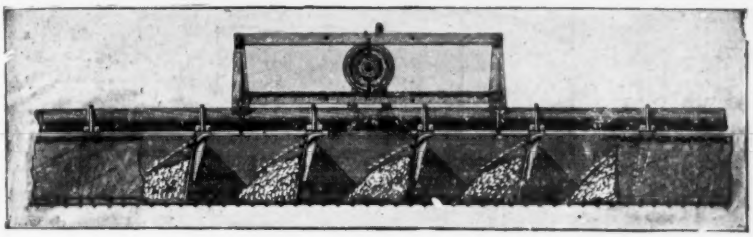
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

Don't throw a casting away

because it looks bad, but is otherwise all right. If it is nothing but "bad looks" that ails a casting, you can dress it up with **Clark's "Cast Steel Cement"** so that it will look as good as the best.

This Cement, as near as it can be described, is

CAST IRON IN A PASTE FORM.

Upon application, it becomes as hard as the casting itself, retaining the same color and general appearance. Send us your address and we will forward price list and a sample.

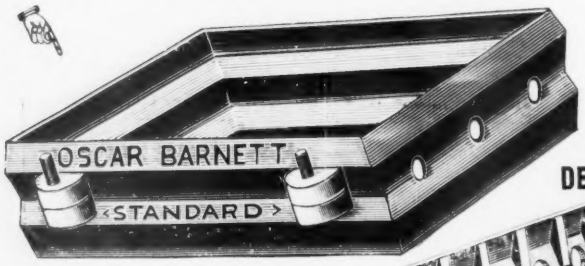
D. N. CLARK & CO., Shelton, Conn.

L. D. PHONE 1045. Our Own Foundry Insures Prompt Shipments. FOUNDED IN "45."

Soft, Smooth Castings and Finished Hardware Specialties to Order.

Our Leader! Hardwood Bench Rammers, 25c PER PAIR F. O. B. Newark.

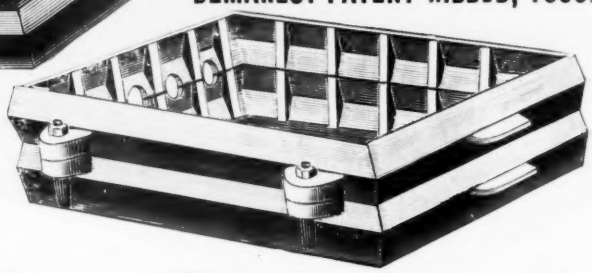
OSCAR BARNETT'S OLD RELIABLE



Ribs in Flasks increase weight and obstruct ramming—two important features. Do you want them? You are the Doctor.

SAME PRICE AS <STANDARD> BEVEL.

DEMAREST PATENT RIBBED, 1855.



<STANDARD> BEVEL FLASK.

All Faces Level, Accurately Assembled, Guaranteed to Interchange Perfectly. Not Bored from Worn Flasks, but Hardened Steel Bushed Templetes. Pins, Steel, 1-1000ths of an inch.

BRASS FOUNDRY SUPPLIES.

Oscar Barnett Foundry Co.

NEWARK, N. J., U. S. A.

Write for Prices

CAN'T GET ALONG

without wheelbarrows. Not on your life. Are those you buy at the hardware store lasting as long as they should? Maybe they were not made for foundry use, like ours. Buy direct from us and you will have wheelbarrows that will stay with you. A postal card gets our Catalog and prices.

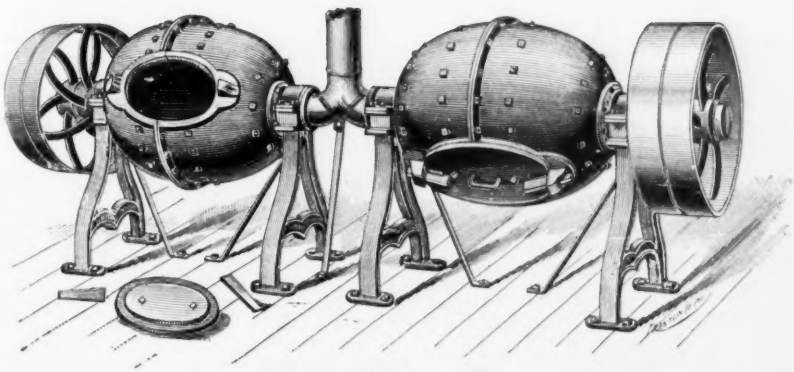
AKRON CULTIVATOR CO., Akron, Ohio.

No. 7½ GRINDER.

This Grinder

was designed by us for foundry use. One stove maker has 16 of them. The distance between wheels is 48 inches, diameter of spindle between flanges 1¾ inches or 2 inches, as ordered Babbitted boxes with three ring oilers. Weight, 1200 lbs. If you want a good substantial grinder write us for circulars and prices.

DIAMOND MACHINE CO. Providence, R. I.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT, ILL

FARWELL'S **MOLDING MACHINES** Send for Catalogue

THE ADAMS COMPANY, DUBUQUE, IOWA

BRASS FOUNDERS SUPPLY CO.,

NEWARK, N. J., U. S. A.

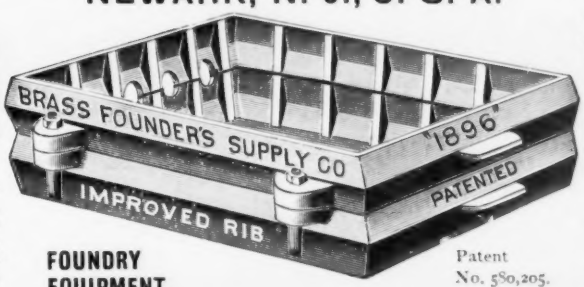
OUR

FLASKS

ARE ALL RIGHT.

SO . ARE . PRICES.

Send for catalogue if interested. ". Send sample for Prices on Gray Iron Castings Our **Furnaces**, round steel shell, with drop grate, are up-to date.



FOUNDRY EQUIPMENT.

Patent No. 580,205.

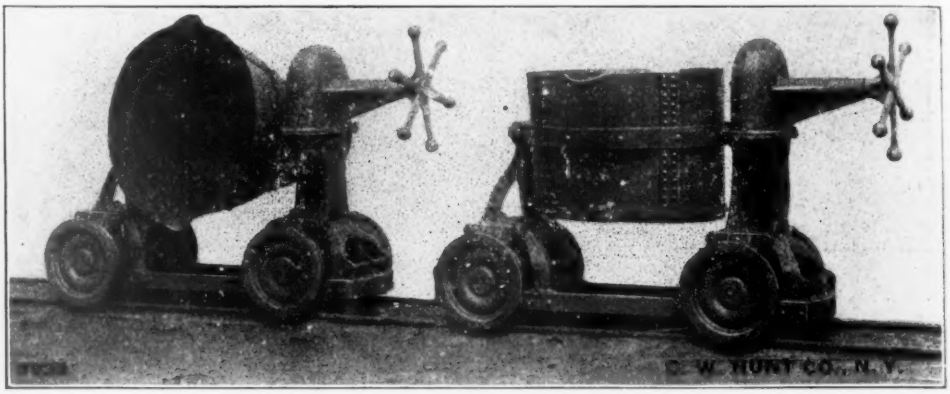
We make . . **Clamps, Boards** and **Other Supplies Castings, too.**

SELLING AGENTS.

S. OBERMAYER CO., Chicago and Cincinnati.

J. W. PAXSON CO., Philadelphia, Pa.

J S. McCORMICK CO Pittsburg, Pa.



Ladle Cars, 1,500, 2,000, 3,000 Pounds Capacity.

Many foundrymen believe that these cars are not only more convenient to use in distributing molten metal, but are also safer than any overhead system of cranes or tackles. No accident has ever occurred in the use of these cars. The height of the top of the ladle above the rails, when upright, is 26 inches; for convenience in pouring into hand ladles, the shape of the body and the position of the trunnions are arranged so that the spout, when tipped, pours into a ladle 17 inches high. The gear for revolving the ladle, is our patent cam gear, that locks the ladle in every position, and possesses the remarkable feature of having both shafts revolve in the same direction. When the handles are moved, the ladle moves steadily in the same direction as the handles, but only one-twelfth as fast.

Our system of narrow-gauge tracks, switches, curves, turntables, etc., for use in manufacturing establishments and to accommodate such special cars as the above, is worthy of careful investigation by those who are apt to be interested. Catalogue No. 9904 contains useful data, besides thoroughly treating this subject. Copies will be mailed to those interested. Please address the works direct.

C. W. Hunt Company, Brad Street, WEST NEW BRIGHTON, NEW YORK CITY.

To produce clean castings you must have clean iron. Probably, on account of the scarcity in pig iron, you are using more scrap than formerly. Having trouble? Get a few barrels of our . . .

Fluor Spar.

It is the genuine stuff and goes further than any other flux.

Are you breaking your light castings in tumbling? Do they appear dirty after being nickel-plated? Both of these faults may be overcome by using our . . . . . .

Hydrofluoric Acid

for pickling. This is the only acid that dissolves the sand instead of the iron. You may like to read up a bit on this subject. A postal card puts you in direct communication with our information bureau.

General Chemical Co., of Pennsylvania,
PITTSBURGH.

ESTABLISHED 1875

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

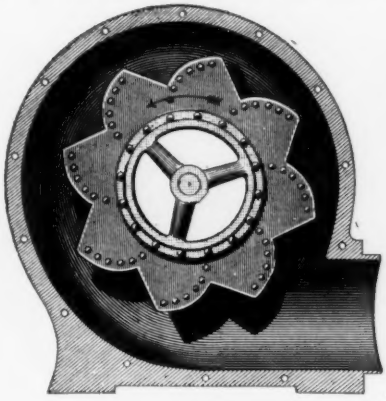
FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES



It is the Inside That Counts.

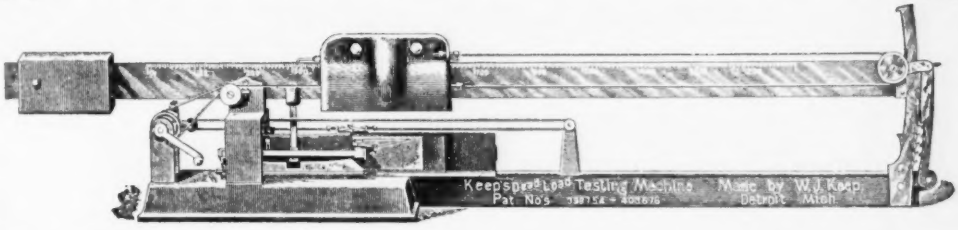
Most anyone could put a good looking cover on some kind of a mechanism and call it a blower. The casing counts for nothing in either watches or blowers. It is the works that put a value on the whole thing. The illustration shows part of the works of the **Poole Pressure Blower.** The bucket wheel (found only in this Blower) produces the greatest volume of air with the least expenditure of power for all pressures up to sixteen ounces. For cupola service, it consumes about half the power of the "Rotary" and costs about one-fifth the price to install. We melt from seventy-five to a hundred tons of iron a day in our own works. We have tried different blowers and fans, and the results justify us in saying that

The Poole Pressure Blower furnishes the best method of handling air for all purposes up to sixteen ounces.

Send for reading matter showing what users think of the "Poole."

Manufactured and Sold by J. B. & J. M. CORNELL, 26th St. and 11th Ave. NEW YORK CITY.

MECHANICAL ANALYSIS



The Only Practical Method for . . . . **MAKING CASTINGS**

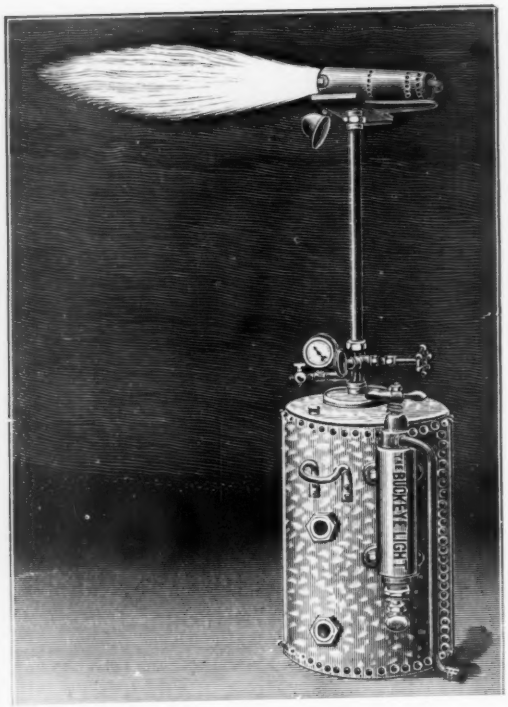
OF A DESIRED QUALITY

AT A LOW PRICE.

Send for Testimonials and for Description of

W. J. KEEP, Detroit, Mich.

KEEP'S TEST APPARATUS.



DON'T FOOL AWAY YOUR TIME

trying to light your shop with lamps, gas or electricity. These things do their work all right any place else except in a foundry. There they fall down. None of them can penetrate the smoke and steam in a foundry at casting time—the very time when a light is needed.

There is only one light for foundries,

THE BUCKEYE LIGHT

and this will pay for itself in a couple of weeks, with the extra work your men will do. We would like to send you our printed matter on "Shop Lighting." Do we get the chance?

McLeod & Clark,

Sole Manufacturers,

457-463 E. Front St., CINCINNATI.

For Sale by

S. OBERMAYER CO., Chicago and Cincinnati.
J. W. PAXSON CO., Philadelphia.
J. S. McCORMICK CO., Pittsburg.

Molding Machines

Lowest Possible Pattern Cost.

SUITED TO ALL CONDITIONS.

1. Gated Work, no Change in Patterns.
2. Vibrator Machines, no Stripping Plates.

The Tabor Manufacturing Co.,

ELIZABETH, N. J.

U.S. TIN

is used in making brass and bronze castings; it makes a superior metal, sounder castings, more homogeneous in structure, richer color, better wearing metal, of higher surface lustre than alloy made with imported tin. U. S. TIN is to be used in same proportions as imported tin.

The Price is Much Lower.

The difference in price, the superiority of metal, and sounder castings should induce all users of metals to make comparative tests. We will send to responsible parties small lots of the U. S. TIN on approval, and if satisfactory, will make contracts covering a given time. Shall be pleased to correspond with all who may be interested.

THE AJAX METAL COMPANY, PHILADELPHIA, PA.

"Short Talks on Advertising."

224 pages, 123 illustrations; sent postpaid on receipt of price.

Paper binding, lithographed cover, 25 cents

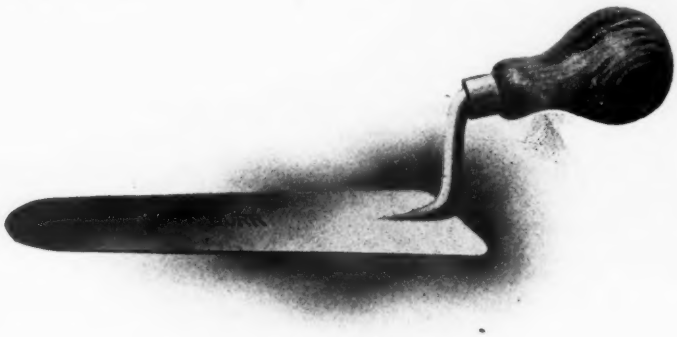
Cloth and gold, gold top, uncut edges, $1.00

CHARLES AUSTIN BATES
Vanderbilt Building
NEW YORK

"Mr. Bates' Masterpiece. It is interestingly and readably written—more readable than one would believe possible on so hackneyed a subject as advertising—and it is illustrated by pictures intended to lend a humorous turn to many of the sentences in the text. For those who want a general idea of advertising principles, the book will be found valuable, and even the readers to whom its subject is more than familiar will find it an interesting companion for a leisure hour. It is full of apothegms, every one of which rings with a true note."—*Geo. P. Rowell.*

"Excellent Work."—*Buffalo Evening News.*
"Interesting and Profitable."—*Baltimore Herald.*
"Lively and Sensible."—*Philadelphia Evening Telegram.*
"Handsome and Clever."—*New York Press.*
"Should be read twice."—*Cleveland World.*
"Should be on the desk of every advertiser."—*Cleveland Press.*
"Best thing we have seen."—*Buffalo Express.*
"Most practical and helpful."—*Minneapolis Journal.*
"Every advertiser may read with profit."—*St. Louis Post-Dispatch.*
"Mr. Bates has rendered a service to all progressive business men."—*Philadelphia Record.*
"Most interesting of all instructive books."—*Buffalo Times.*
"Full of ideas of value."—*Cleveland Leader.*
"Nothing humdrum or commonplace."—*Buffalo Commercial.*
"Full of snappy, commonsense hints"—*Boston Advertiser.*
"Striking and Readable."—*Baltimore American.*
"Cannot fail to prove interesting."—*Pittsburg Press.*
"Should be in the hands of every business man."—*Philadelphia Ledger.*

WE are the largest manufacturers of Molders' Tools in the world. Every first class Foundry Supply House and Hardware Store sells them.



If you want the Best Tools made, be sure and order Tools manufactured by

BURR'S DAMASCUS TOOL WORKS,

66-72 FORT STREET EAST, DETROIT, MICH.

The Pioneer of Core Compounds is

STEWART'S

LIQUID CORE COMPOUND

Have You Tried It?

Send a postal card for some reading matter about the genuine article.

W. H. STEWART, 105 John St., NEW YORK.

Manufacturer of

Patent Lap-Seal Ready Roofing.
Roof Coating.
Roof Paints and Cements.
Liquid Paints.
Shingle Stains.
Plastic Stove Brick.
Retort Cement.
Furnace Cement.

Send for Descriptive Circulars.

AIR COMPRESSORS

FOR OPERATING

Pneumatic Chipping Hammers, Hoists, Casting Cleaners, Sand Blast Machines, Molding Machines and other appliances in foundry work.

COMPLETE OUTFITS FURNISHED AND INSTALLED.

For Circulars, Full Information and Prices, address . . Clayton Air Compressor Works

Havemeyer Building, 26 Cortlandt Street, NEW YORK.

E. A. FORD,

GEN. PASS. AND TICKET AGENT, PITTSBURG, PA

MICHIGAN CENTRAL

"The Niagara Falls Route."

A FIRST CLASS LINE FOR
FIRST CLASS TRAVEL.

ROUTE OF THE **"North Shore Limited."**

"As near perfection in the way of construction, appointments, service and able management as can be conceived in modern railroading.—*Extract from report of Railroad Commissioner, State of Michigan.*

O. W. RUGGLES, G. P. & T. Agent, CHICAGO.

WE HAVE IT!

THE FINEST SERVICE BETWEEN **Detroit and Cincinnati**

VIA

LAKE SHORE—BIG FOUR LINE

Through Trains with Parlor and Sleeping Cars leave Detroit from foot of Brush Street, landing you direct in **Grand Central Union Station,** Cincinnati. Positively the only line avoiding depot transfers to any point South.

WARREN J. LYNCH, Pass. Traffic Manager, CINCINNATI. H. J. RHEIN, General Agent, DETROIT.

The Molders' Text Book.

American Foundry Practice.

The Iron Founder.

The Iron Founder Supplement.

THESE FOUR BOOKS comprise a library which anyone connected with the foundry business should possess. They tell a great many things about molding and melting that has never been told before.

The price of each is $2.50.

They are worth many times that much to any foundryman who likes to keep posted.

The Foundry Publishing Company,
DETROIT, MICH., U. S. A.

DO YOU MAKE LIGHT OR HEAVY

Dry Sand and Skin Dried Work?

IF SO, YOU SHOULD USE

McCORMICK'S

VULCAN BLACKING.

It makes as clear and smooth a casting as the best plumbago and better than the silver leads. Not an experiment—in use in the largest foundries. A trial will satisfy you of its value.

MADE ONLY BY

J. S. McCORMICK CO., PITTSBURG, PA.

A GOOD THING!

That's what you are missing when you fail to use **"DOME" FIRE CLAY.** One Steel Manufacturing Company has used *fifty carloads since January 1st, 1899;* another formerly used the highest grade of Pennsylvania Clay and is now using **"DOME" CLAY** *exclusively;* and so on.

Let us send you a *free sample for test,* and put you in the way of saving over 100 per cent. on your Clay bills, *sure.*

Our Cupola Blocks, Fire Brick, Molding Sand, Fire Sand, etc., are of the most substantial kind.

Our References—any Leading Manufacturer in the Northwest. *Write us!*

GARDEN CITY SAND CO.,

LONG DISTANCE PHONE, M 5102.

188 Madison Street, CHICAGO.

One Way

to learn anything about a cupola is to go around to your neighbors and friends, telling them all about your troubles, showing them that on general principles you don't know much, asking them to be charitable enough to loan you sufficient information to run a heat or two.

Another Way

is to get KIRK's book, **"The Cupola Furnace,"** which tells all you want to know about a capola, how it should be lined, daubed and charged; in short, how it should be operated to get the best results.

KIRK's book tells you these things without calling everybody's attention to the fact that you are looking for information. It gives you a pointer here and there which helps you to get along better than your neighbors.

You should read it and let the other fellow go gunning for information.

We have never yet see the foundryman who could not secure Three Dollars and a Half's worth of good reliable help from this book. We will mail you a copy prepaid at that price.

The Foundry Publishing Company,

DETROIT, MICH., U. S. A.

The Foundry Publishing Company,
Detroit, Mich., U. S. A.:

Send Kirk's **"Cupola Furnace"** *to*

_____

_____

_____

For Immediate Delivery Subject to Prior Sale.

Second-Hand Foundry Equipment.

1 8 to 10-ton Colliau Hot Blast Cupola.
1 14 to 16-ton Colliau Hot Blast Cupola.
2 No. 3 Whiting Cupolas.
1 72-inch diameter home-made Cupola.
1 36 inch diameter home-made Cupola.
1 No. 24 Colliau Cupola.
1 No. 5 Blakney Cupola Furnace.
1 Craig Ridgway & Son's 12-ton cap. Hydraulic Crane, 36-inch Cylinder, 24-foot swing.
1 Craig Ridgway & Son's 5-ton cap. Hydraulic Crane, 12-inch Cylinder, 22-foot span.
1 6-ton cap. Yale & Towne Traveling Crane, 16-foot span.
1 5-ton cap. Yale & Towne Traveling Crane, 40-foot span.
1 Traveling Crane, 25-foot span.
3 Wooden Jib Cranes.
3 Friction Tumbling Barrels, 48x30-inch, with pulleys and countershaft.
2 Friction Steel Tumbling Barrels, 24x36-in., with pulleys and countershaft.
1 Friction Tumbling Barrel, 36x44 inch.
1 Friction Tumbling Barrel, 60x44-inch.
5 Iron Tumbling Barrels, 1 20 inches diameter by 31 feet long.
(These are driven by Sprocket Wheel and Chain; we have chain, wheels and shafting.)
1 4 feet, 6 inches diameter by 4 feet, 10 inches long.
1 3 feet diameter by 4 feet long.
1 3 feet, 6 inches in diameter, by 2 feet, 7 inches long.
1 2 feet, 3 inches in diameter by four feet long.
1 10,000 lb. cap., Worm Geared Ladle, tap from bottom.
2 10-ton Geared Ladles.
1 4,000 lb. cap., Ladle and Bail (not geared).
1 1,500 lb. Crane Ladle, with shank.
1 Whiting Power Sand Sifter (never used).
1 No. 11½ Buffalo Blower.
1 No. 9 Buffalo Blower.
1 No. 4½ Baker Blower.
1 No. 6 Baker Blower.
2 No. 7 Baker Blowers.
1 No. 1 Root Blower.
1 No. 5 Root Blower.
1 Boom Derrick with Machine and Drop.
1 Belt-Driven Elevator, one or two stories, with countershaft and belting.
1 Weston Triplex Chain Block, 3,000 lb. cap.
1 Fairbanks-Morse & Co. 10-ton wagon scale.
1 Howe 6,000 lbs. cap. Platform Scale.
2 Iron Carriages.
4 Core Ovens.
1 Tabor Molding Machine, suitable for flasks 12 inches by 40 inches.
1 lot of Clamp Pulleys.
1 lot complete of Builders' Hardware Brass Patterns ready for the sand.

LET US KNOW WHAT YOU WANT.

The J. D. Smith Foundry Supply Co.

Manufacturers of
FOUNDRY FACINGS and BLACKINGS.
Everything for the Foundry.

CINCINNATI, OHIO,
U. S. A.

Here's Advice, Will You Take it?

SINCE THE IMPROVEMENT in the iron business many of our friends among the foundrymen have had their hands more than full. One of them even said he would like to have hard times come again, he was so worried with the orders for castings that he could not fill properly, and so bothered to find enough molders that he was disgusted with prosperity.

Foundrymen's minds are filled to such an extent with the details of manufacturing, that they cannot give proper attention to securing satisfactory pig iron mixtures. The scarcity of iron and over-sold condition of blast furnaces, make it necessary to forsake old mixtures and try brands not heretofore used.

PIG IRON

COKE

It is our business to know all about the different kinds of pig iron made in this country and our experience and services are freely offered to all foundrymen having difficulty with their mixtures, or who are in search of satisfactory substitution for brands not now obtainable. Do not "tell your troubles to a policeman," but write them to us. We are agents for forty brands of pig iron and handle many others, and also sell the best foundry cokes.

Now a suggestion regarding the market. It is generally supposed that when prices of iron are not going up, they must be going down. It has worked that way for several years, but do not be deceived. The country is full of consumers who have had little faith in so-called high prices and they are waiting for the turn. In the meantime, the largest melters are steadily placing contracts for pig iron to be delivered through the first half of 1900, and the output of furnace after furnace is being taken from the market. The danger is that the doubters will realize the true condition nearly simultaneously and their rush to cover will jump prices again. ***Our advice is to buy now.*** If you do not, lay this away for a few months and then see if you would not have profited by acting on it.

ROGERS, BROWN & CO.

CINCINNATI, NEW YORK, CHICAGO, BUFFALO, PHILADELPHIA,
PITTSBURGH, CLEVELAND, BOSTON, ST. LOUIS, BIRMINGHAM.

This is What We Have to Offer You—

THE BEST AT LOWEST PRICES.

Shovels
Riddles
Brushes
Bellows
Molders' Tools
Chaplets
Crucibles
Pattern Letters
Hay Rope
Coke Forks
Mallets
Pattern Dressing
Buckets
Brass Sand
Etc., Etc.

SEND FOR GENERAL CATALOG No. 26

Pure East India Plumbago
American Graphite
Sea Coal or Bituminous Facing
Heavy Machinery Facing
Reliance Dry Sand Blacking
Core Compound
Peerless Core Wash
Talc
Perfect Core Wash
XXX Heavy Stove Plate
and
National Return Facing
Fire Brick and Cupola Blocks

THE S. OBERMAYER CO.

CINCINNATI, OHIO. ✱ CHICAGO, ILLINOIS.

SOMETHING NEW and SOMETHING GOOD.

Please don't throw away a large casting on account of a small imperfection or a "blow hole."

WE CAN SAVE THE CASTING.
WE CAN SAVE YOU TIME.
WE CAN SAVE YOU MONEY.
WE CAN SAVE YOU TROUBLE.
WE CAN SAVE YOUR SOUL,
(by preventing your using lots of bad words.)

AND ONLY BY USING

NATIONAL IRON FILLER

which is the same color as the casting and gets hard as the iron, and sets in less than 20 hours and remains as hard and tough as the iron itself.

PRICE, 25 CENTS PER POUND.

NO MORE, NO LESS. PUT UP IN 12-POUND CANS.

Full Directions for Using Given With Each Shipment.

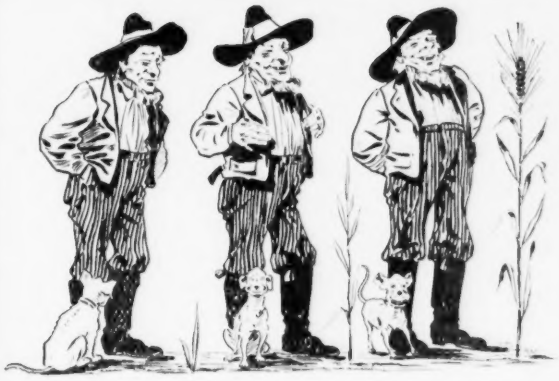
MANUFACTURED ONLY BY

THE S. OBERMAYER CO.

CINCINNATI. CHICAGO.

"Everything you Need in Your Foundry."

SEND FOR CATALOGUES.



Growing Into Money

WHEN the farmer plants his seed in properly tilled soil it grows into money without his influence on the future crop one way or the other.

Our OBERMAYER BLOCK, size 12 x 6 x 6, is made of the very best material ADAPTABLE for the HARD USAGE of a CUPOLA. The use of this Block insures a good harvest, for the reason that they LAST LONGER, and consequently give better results than a large percentage of so-called Cupola Blocks now on the market, which have the shape but not the FIRE-RESISTING QUALITIES.

The use of our Block insures a good CROP OF PROFIT.

We guarantee all linings to be entirely satisfactory. Sizes to fit any shell in stock at Cincinnati, Chicago and Works—Oak Hill.

Write us for prices and any information regarding any kind or shape Cupola Block.

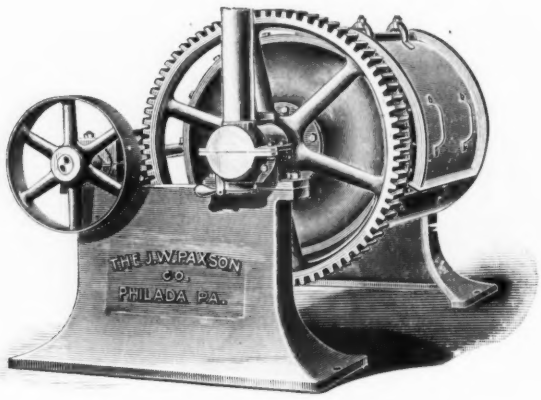
We make anything in the way of Fire Brick

THE S. OBERMAYER CO.

CINCINNATI. Works—OAK HILL. CHICAGO.

Paxson Exhaust Rumblers

MADE OF STEEL.



MADE IN SIZES:

18	inch	diameter,	any	length	from	24	inch to 48	inch.
24	"	"	"	"		30	" 48	"
30	"	"	"	"		36	" 54	"
36	"	"	"	"		36	" 54	"
40	"	"	"	"		36	" 60	"

No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

LOCATION AND AREA OF TUYERES INSURE THE HIGHEST MELTING . . . EFFICIENCY. . . . . .

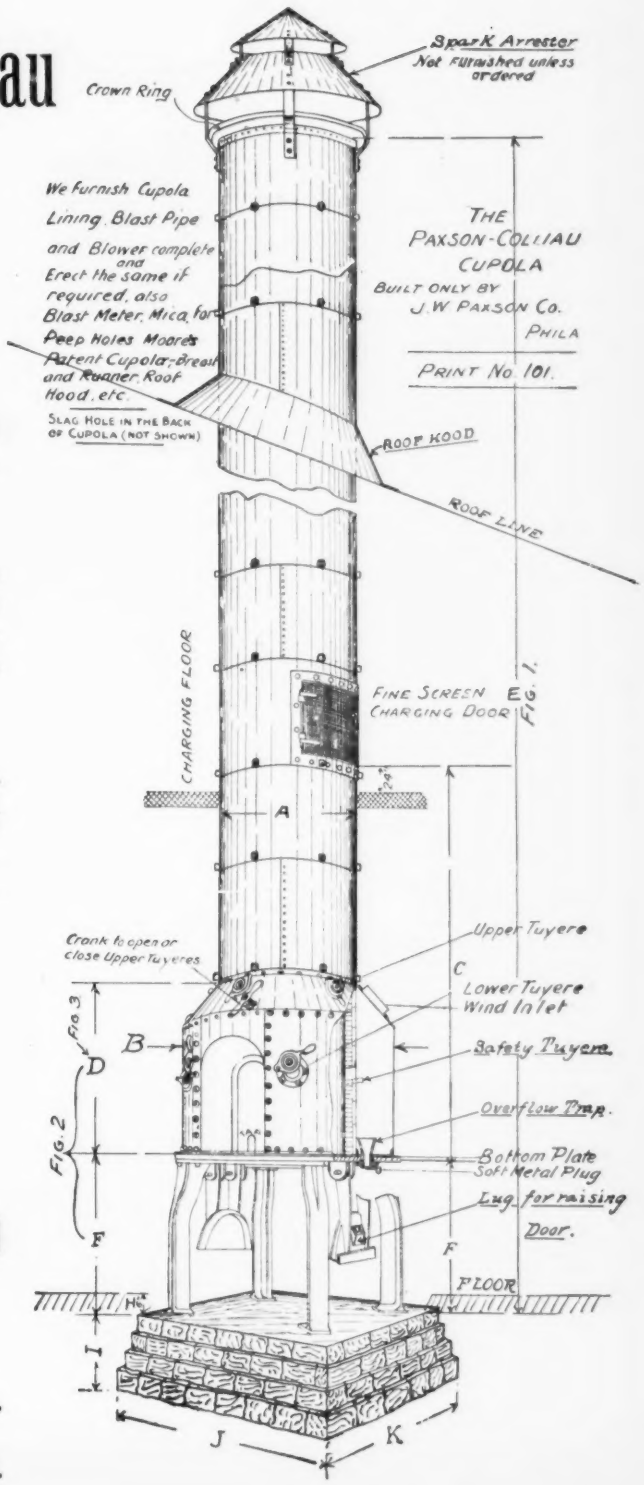
It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

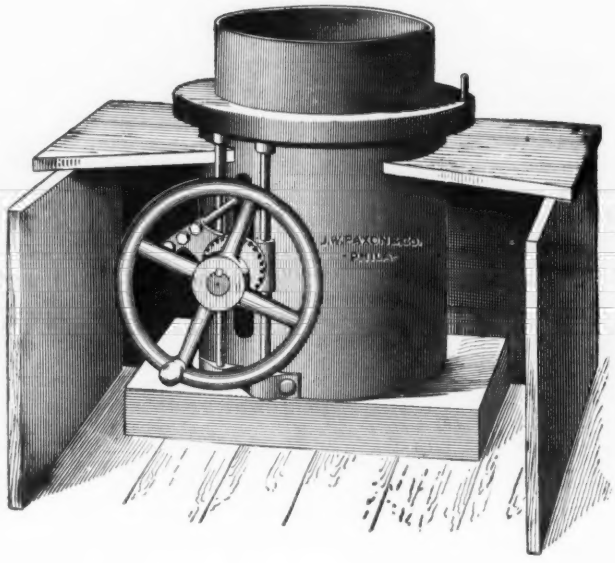
J.W. Paxson Co.

1021 . . .
North Delaware Avenue,

PHILADELPHIA, PA., U. S. A.



Paxson Pulley Molding Machine.



ANY SIZE CAN BE MADE TO ORDER.

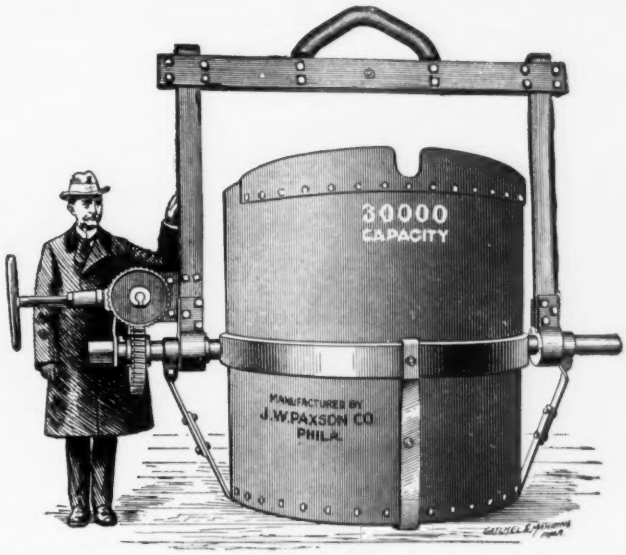
4 inch. to 12 inch	Machine.	48 inch to 60 inch	Machine,
12 inch to 24 inch	"	60 inch to 72 inch	"
24 inch to 36 inch	"	72 inch to 84 inch	"
36 inch to 48 inch	"		

This Machine will only make a *Flat* Face Pulley, but a Crown-Faced Pulley can be made by making a collar of required thickness and placed on the Pattern around the rim.

ASK FOR PRICES.

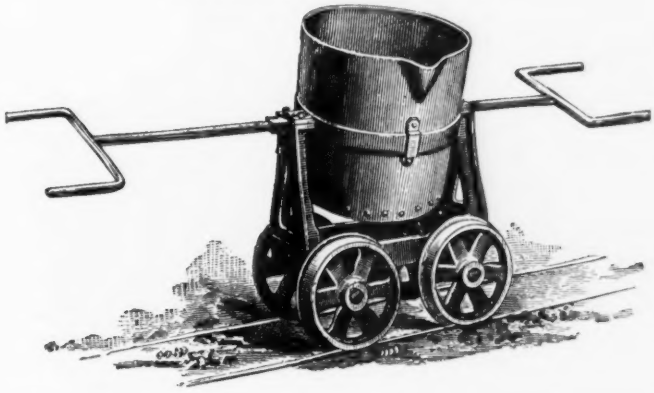
J. W. Paxson Co., 1021 North Delaware Ave., PHILADELPHIA, Pa.

Large Crane Ladles WORM GEARED



No. A—GEARING No. 1—BAIL No. 1—LIP

TRUCK LADLES



Made in all sizes and styles from 50 lb. to 30,000 lb. capacity.

ASK FOR PRICES LARGE STOCK ON HAND

MADE BY

J. W. Paxson Co.

1021 North Delaware Ave.,
PHILADELPHIA, PA.

Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.

CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

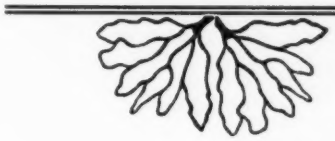
Joseph Dixon Crucible Co.

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

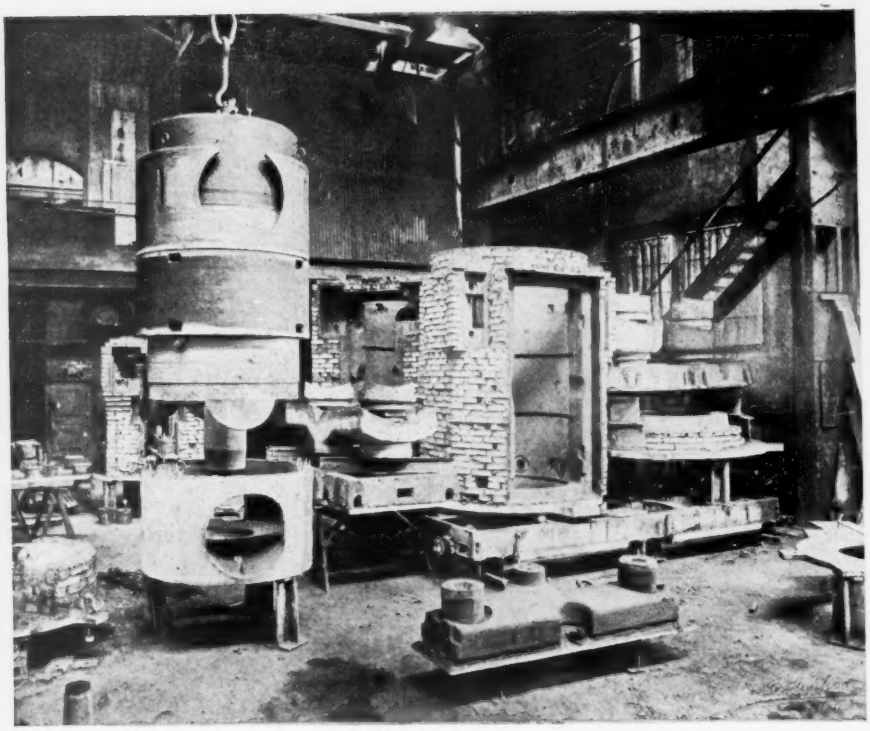
537=39 *West 27th St.,*
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.



WHEN IT COMES TO LOAM WORK

the **C. F. M. Perfect Wash** simply stands in a class by itself. Such jacket cores as are shown in this illustration require a week's labor to remove them in some foundries. That is because the stuff they use for blacking them is N. G. With the **C. F. M. Perfect Wash** the cores leave a casting almost of their own accord. The cost of cleaning a casting is, by its use, reduced to the minimum.

The Perfection Core Box

Shall we saw off a piece and send it to you? It will save you seventy-five per cent. of what you are now spending for **straight** and **chambered** core boxes. Our new catalogue is a piece of printed information that you should have. It is sent free.

The Cleveland Facing Mill Co.,

FRANK H. CHAMBERLIN, Proprietor. CLEVELAND, OHIO.

M. M. COCHRAN, PRES.
J. R. LAUGHREY, VICE-PRES.

JNO. H. WURTZ, SECY.-TREAS.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal.

5000 Tons Daily Capacity.

300 30-TON COAL CARS

50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

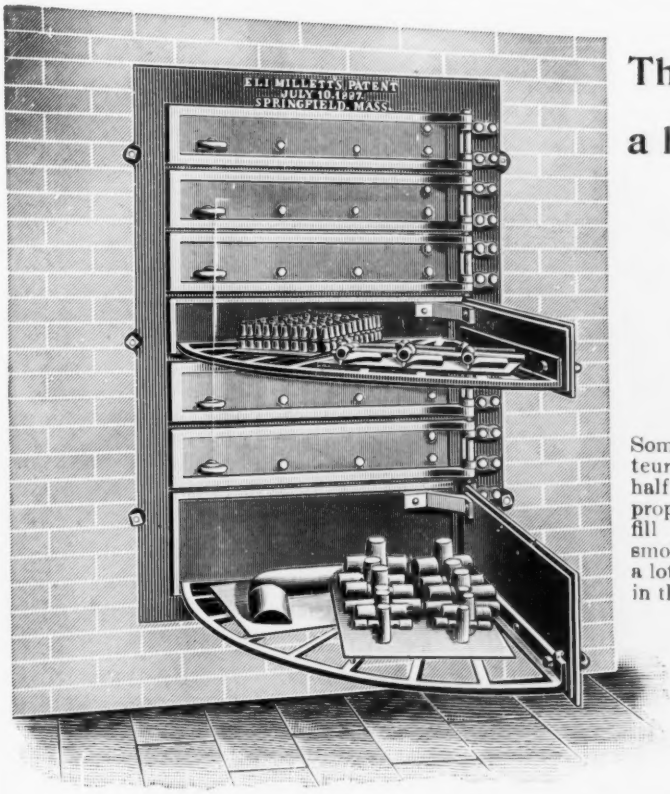
These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.



There is a lot of Core Ovens

Some are built by amateurs, who not only waste half of their fuel, by improper construction, but fill their shops with smoke and dirt, and get a lot of half dried cores in the bargain.

Then there is cheap sheet iron affairs made to sell cheap and doing cheap work. Such ovens never give satisfaction.

If you are losing more of your castings than you think you ought to, investigate your Core Oven facilities.

THE MILLETT CORE OVEN

shown here is the only Core Oven that will bear investigation. All leading foundries at home and abroad use them. We shall be glad to send you a string of names showing who these people are. May be some of them are located in your own neighborhood. If so you can go and see how

THE MILLETT CORE OVEN

works. In that case we will not have to do any talking to convince you, that it is just **the** Oven you want.

If you are in Philadelphia, the J. W. Paxson Co., will show them to you. The S. Obermayer Co., will accommodate you the same way in Chicago and Cincinnati.

Millett Core Oven Co.,

Brightwood, Mass.

When you Figure Up

What it costs you to build a brass furnace with brick piers that are always falling down, you will find that this form of construction is not so cheap after all. The draft is obstructed by these same piers, melting is retarded, and the time you waste represents a certain sum that you can charge to no other item except to profit and loss.

The *Millett* people, (makers of the *Millett Core Oven*) have designed a brass furnace that is as perfect for melting brass as their core oven is for drying cores, and none are as good. When you get a *Millett Brass Furnace* you have something that will work day after day, in all kinds of weather. You have a furnace that you *know* will melt brass and like metals in the most economical manner.

The Millett Brass Furnace will not have to be closed down every other day for repairs. Once you put it in, your troubles from that part of your works will cease.

We have a Booklet, showing the construction of the MILLETT BRASS FURNACE that we would like to send you. May we have your address ?

Millett Core Oven Co.,

BRIGHTWOOD, MASS., U. S. A.

Sole manufacturers of the Millett Core Oven and the Millett Brass Furnace.

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
CINCINNATI, ST. LOUIS.
Agencies.
Chicago, Detroit, New York,
Philadelphia. Pittsburg.

DAYTON COAL & IRON CO.
(Limited)
PIG IRON,
Dayton, Tenn. Cincinnati, Ohio.

DECAMP BROS. & YULE,
Pig Iron and Coke.
Sole Agents McNair & DeCamp's
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MALLEABLE BESSEMER PIG IRON.
Fullerton Building, St. Louis.

THE DOMHOFF & JOYCE CO.
PIG IRON and COKE.
702 Fisher Building,
CHICAGO. CINCINNATI.

F. A. GOODRICH & CO.
Incorporated
PIG IRON, STEEL, COKE, ETC.
Detroit, Mich.

M. A. HANNA & CO.
COAL, IRON ORE
and PIG IRON.
Cleveland, Ohio.

THOMAS A. MACK,
PIG IRON,
Cincinnati, - - Ohio.

COLUMBUS, O. CHICAGO, ILLS.

MILLER, WAGONER, FIESER & COMPANY.
PITTSBURGH, PA.

J. J. MOHR.
Foundry, Forge, Charcoal and Bessemer
PIG IRON,
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PICKANDS, BROWN & CO.
Manufacturers, Importers
and Dealers in
PIG IRON AND IRON ORE.
Rookery Building, CHICAGO.

C. L. PEIRSON & CO.
PIG IRON and COKE.
Foundry Mixtures a Specialty.
BOSTON. NEW YORK

PILLING & CRANE.
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PITTSBURG, PA.
Girard Building,
PHILADELPHIA, PA.

ROGERS, BROWN & CO.
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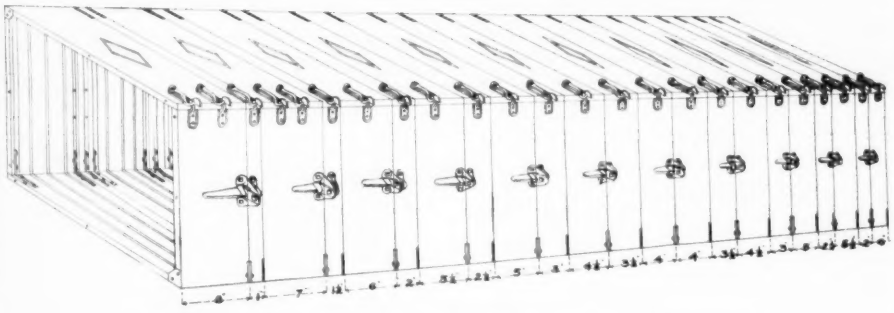
BUFFALO,
PHILADELPHIA, NEW YORK,
ST. LOUIS
PITTSBURG. CLEVELAND.

STEVENSON, FIELD & CO.
PIG IRON and COKE.
Columbus, O. St. Louis, Mo

HEADQUARTERS FOR

Flasks and Pattern Shop Supplies.



We Manufacture from the Raw Material

All sizes of straight and taper Snap Flasks, for bench and machine molding.
All sizes and styles of Brass Molders Flasks.
Standard Pins for Iron Flasks. Special styles to order.
All sizes of adjustable Clamp Heads.
Standard Wood Wedges and Dust Bags.
Sprues for Bench and Squeezer work.
The New Diamond Snap Flask is made of the very best of material, with Malleable Iron trimmings mortised and dovetailed into the wood. The pins and sockets are put on with bolts and the hinges are warranted not to get loose from the wood. Five thousand now in use.

The Original Diamond Dowel Pins.

NONE GENUINE UNLESS TRADE MARK ON BOX.

200,000 NOW IN USE.

Brass Dowel Pins, Brass Drill Centres, Wood and Leather Fillets, Rapping Plates, Clamps, Pattern Letters of all kinds ; in fact everything used in the Pattern Shop.

Diamond Clamp & Flask Co.,

RICHMOND, Ind., U. S. A.

ROOTS' BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS
BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

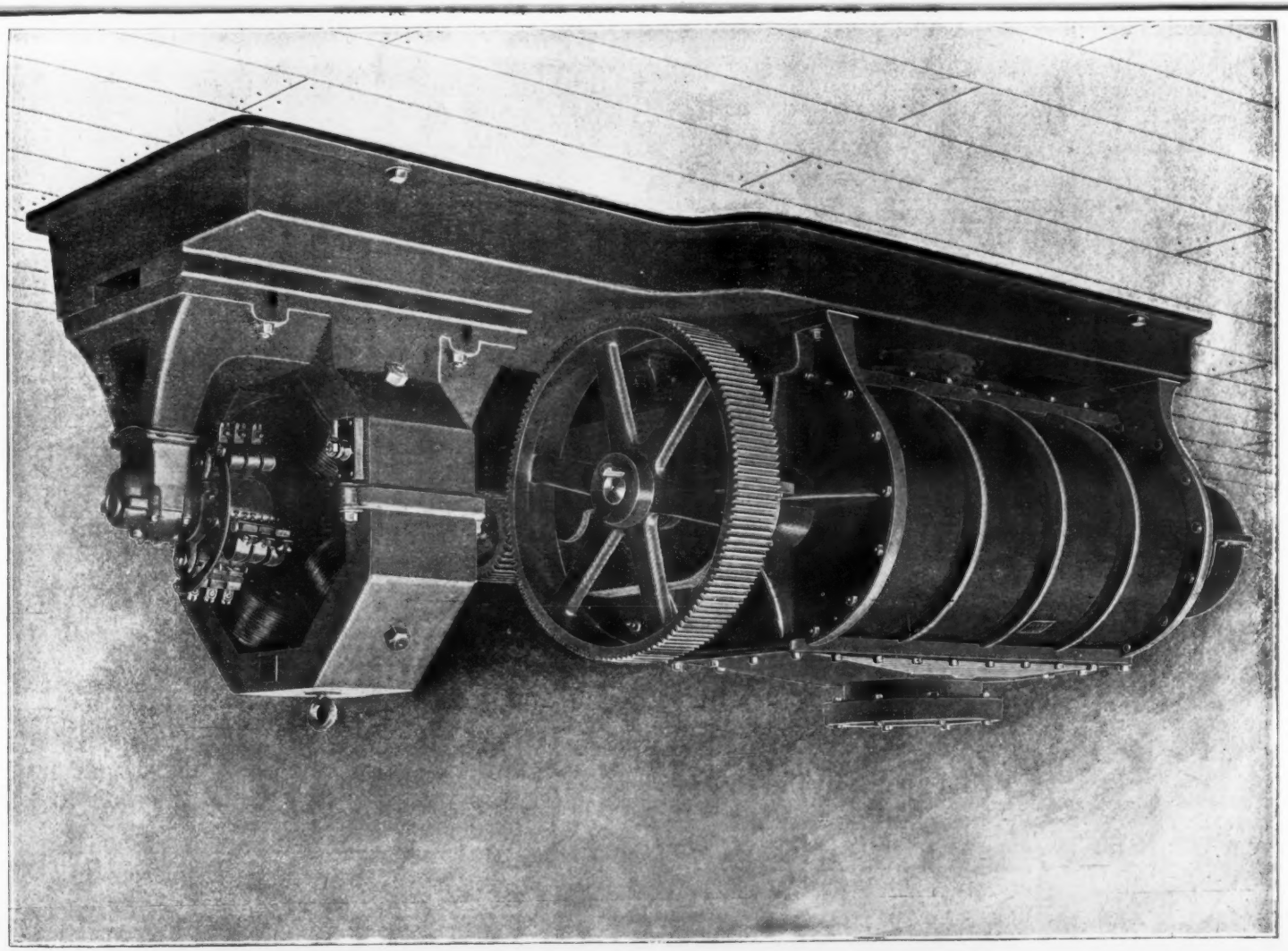
Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

P. H. & F. M. ROOTS CO.,
109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

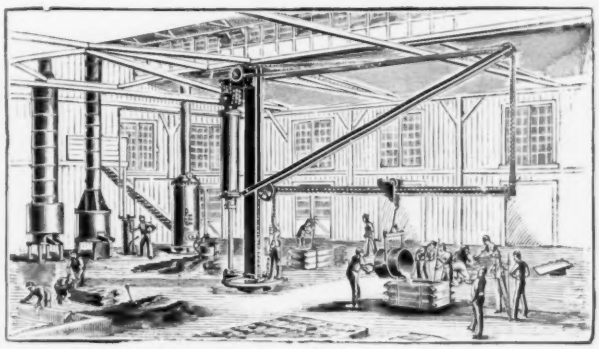
C. H. BRADLEY, JR. & CO.,
Vandergrift Building,
PITTSBURG, PA.

EDMUND A. FORDYCE,
156 Lake Street,
CHICAGO, ILL.



"Listen Wunst!"

AS THEY SAY IN BERKS CO.



5-Ton Steam Hydraulic Crane in a Foundry

"You will remember us having had your cranes in use for a number of years. We are figuring for enlarging. We want more of your machines.

RENSSELAER MFG. CO.,
Troy, N. Y."

NEXT:

"The crane we have of you is so satisfactory that we have decided to get a 7-ton one for our new foundry and also an elevator.

THE HENDEY MACHINE CO.,
Torrington, Conn."

THREE TIMES FOR LUCK.

"We send order for another 3-ton crane and we want it in every respect like the last 5-ton crane, which has served us so well. NATIONAL TUBE CO., Middletown, Pa."

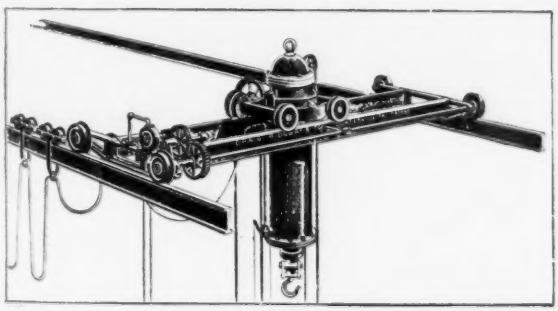
AGAIN.

"Make us another crane as soon as you can. The one you furnished us before is all right and we want the new one for enlargement of our foundry.

HARRISON SAFETY BOILER WORKS, Philadelphia."

And we have others, but these four happen to be next door neighbors on our order book, is why they are selected. These are not "testimonials." Every man who has used Ridgway cranes gets more of them. The only reason you don't use Ridgway cranes is because you don't know it

HYDRAULIC AIR HOISTS



Since we are Quoting Letters today we submit this:

"Having used one of your oil governed hoists for a year and a half, and it having given entire satisfaction, we want some of your large ones, etc.

LOWELL MACHINE SHOP,
Lowell, Mass."

AND the Hoists we now make are 500 per. cent. better than what we made a year and a half ago. Get one and try it.

"PLEASE TAKE THE ELEVATOR."

BEST THERE IS.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

EUROPEAN AGENT,

CHAS. G. ECKSTEIN, 16 Spandauerstr., Berlin, Germany.

William Sellers & Co. Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.
ECONOMICAL.
EXPEDITIOUS.

NOTE.--In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing molding sand, facing sand,** and **core sand**, we have issued a small pamphlet which will be sent on application.

Among late Purchasers are :

American Radiator Co., Buffalo, N. Y.
American Radiator Co., Titusville, Pa.
National Malleable Castings Co., Indianapolis, Ind.
National Malleable Castings Co., Cleveland, Ohio.
Fischer Foundry & Machine Co., Pittsburg, Pa.
R. Hoe & Co., New York.
U. S. Arsenal, Rock Island, Ill.
Michigan Malleable Iron Co., Detroit, Mich.
New York Air Brake Co., Watertown, N. Y.
Norfolk & Western R. R., Roanoke, Va.

And YOU would find as they have found, that it is one of the most valuable machines you can put in your Foundry.

Correspondence Is Solicited.

"THE WELLS LIGHT" REG
WALLWORK & WELLS' PATENTS

Over 15,000 in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

ROSS-MEEHAN FOUNDRY CO.
CHATTANOOGA, TENN., May 5, 1896.

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y, & Treas.

REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

BETTER COMPLETE YOUR

FOUNDRY EQUIPMENT

BY INSTALLING A MODERN CRANE.

We build them in any style
for capacities from one ton upwards.

ACORNER IN OUR CONSTRUCTION SHOP.

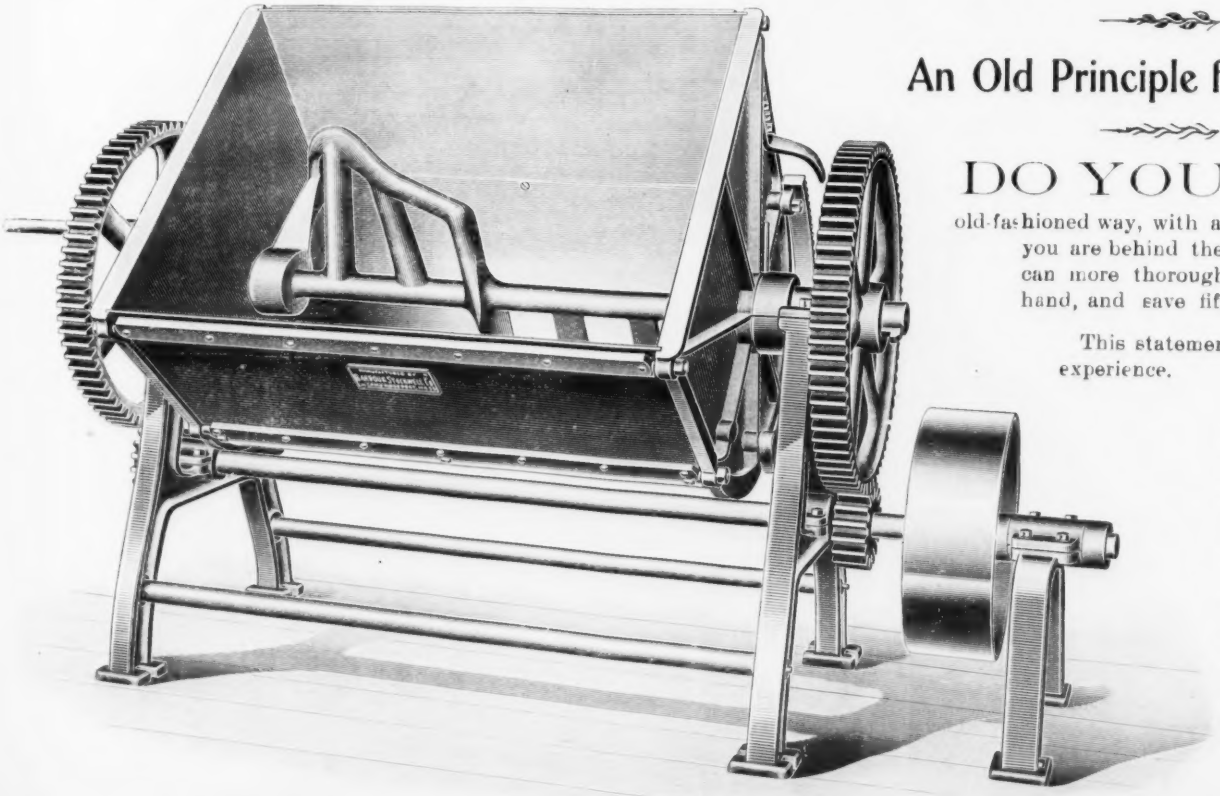
We have them in operation in many of the large Foundries and the results warrant our statement: "WE CAN PLEASE YOU."

All Styles Jib Cranes, Crab Winches, Hand Hoists and Racking Trolleys.

The Case Manufacturing Co.,

Columbus, Ohio, U.S.A.

BOSTON FOUNDRY MIXER.



An Old Principle for a New Purpose.

DO YOU mix your facing sand, core sand, fire clay, etc., in the old-fashioned way, with a laborer and a shovel? Then you are behind the times. With this mixer, you can more thoroughly mix it than is possible by hand, and save fifty per cent. of your labor.

This statement can be verified by actual experience.

The material is shovelled into the machine or fed in through a hopper, after riddling. The machine is then started, and in five minutes the mass is perfectly mixed. Turning a crank at the side cants the machine and empties the material either on the floor or into a receptacle provided.

Capacity, 250 lbs. every five minutes.

Pulley, 24 in. diam. x 6 in. face.

Floor Space, 7 ft. x 3 ft.

Speed of Pulley Shaft, 125 revolutions.

Weight, 1250 lbs.

For further particulars, write

BARBOUR-STOCKWELL CO., 205 BROADWAY, CAMBRIDGEPORT, Mass.

Don't carry your Iron

from one end of the shop to the other by human labor. It is the most expensive power you could possibly use.

Don't take your Flasks

and Molding Sand into your shop with a wheelbarrow. It takes a man to push each wheelbarrow, and he won't push very much at a time either. Besides he will be continually interfering with other workmen, who should be let alone.

Don't take your Castings

out of the shop with that same wheelbarrow. It is expensive. It is annoying. It is not the way to do it.

Do put in a Coburn Trolley Track.

Have a main line in your foundry. Have a branch to your flask yard and sand bin. Have another to your cleaning room. *A Coburn Trolley Track* interferes with nothing. It is up and out of the way. A single man will move a horse load.
It costs very little to put in a *Coburn Trolley Track.* No expensive foundations to put in. No overhead motors to get out of order.

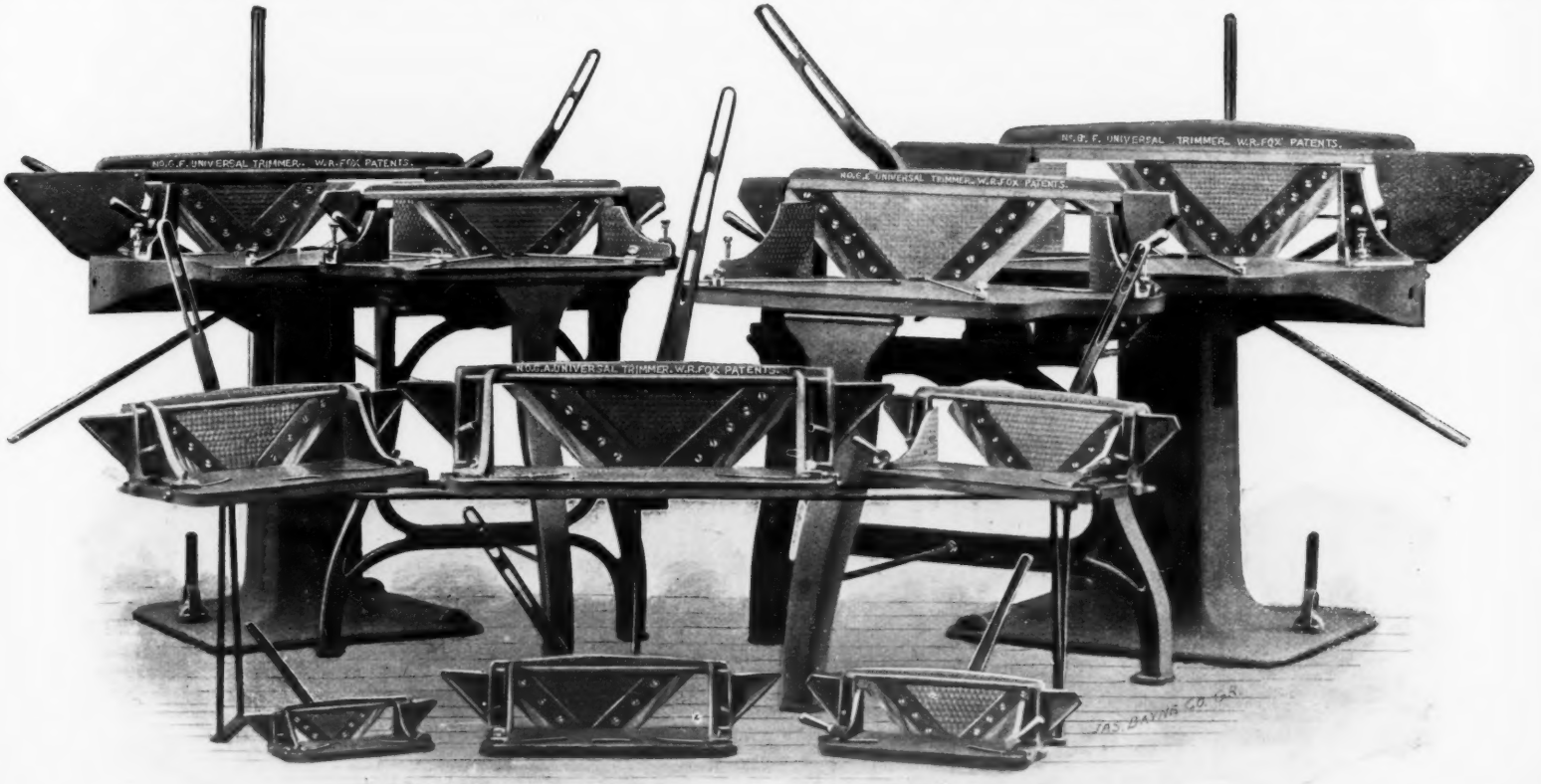
The Coburn Trolley Track

gives the ideal service to all shops. It is the one medium of handling molds and material that is at the same time both good and cheap. If you will give us an outline of your shop we will give you some pointers on how you might do better. Send this along to-day.

COBURN TROLLEY TRACK MFG CO.,

HOLYOKE, MASS.

THE ORIGINAL IMPROVED FOX UNIVERSAL TRIMMERS.


No. C. F. UNIVERSAL TRIMMER. W. R. FOX PATENTS.
No. B. F. UNIVERSAL TRIMMER. W. R. FOX PATENTS.
No. E. UNIVERSAL TRIMMER. W. R. FOX PATENTS.
No. A. UNIVERSAL TRIMMER. W. R. FOX PATENTS.
JAS. BAYNE CO. GR.

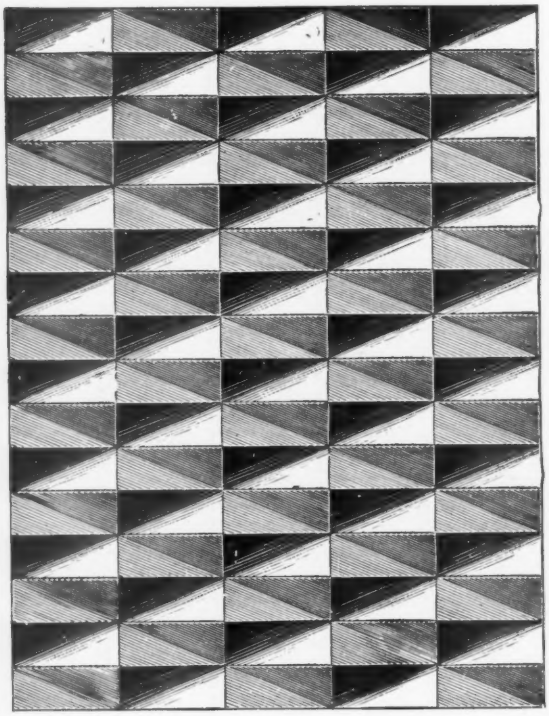
TEN SIZES

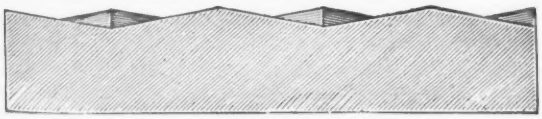
Cut 2 in. to 8 in. High or 2 in. to 24½ Long.
Beds 4½ x 9½ to 24 in. x 40 in.

12,000 SOLD.

Write for Complete Catalogue and Prices.

FOX MACHINE CO., 850 N. Front St., GRAND RAPIDS, Mich.





The above cut shows exact size of Diamonds.

Diamond Pattern Lumber,

—FOR—

DOOR SILLS, PLATFORMS, STEP PLATES, Etc.

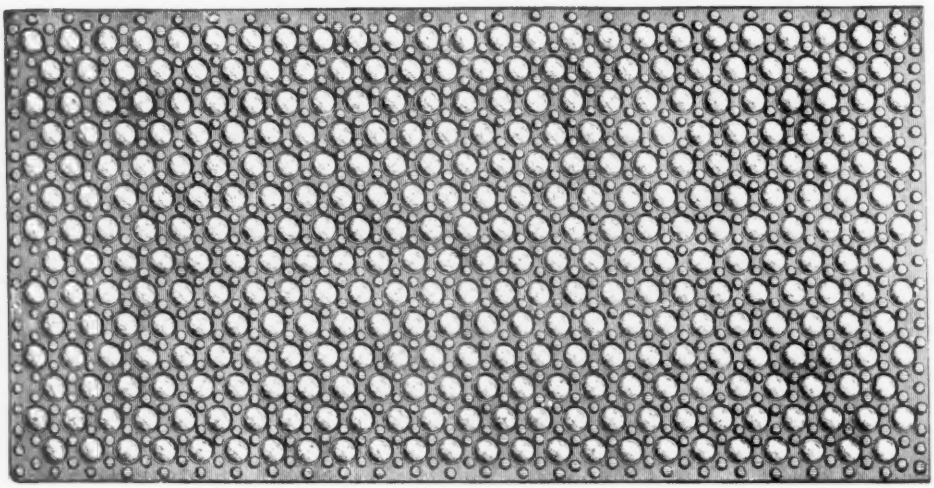
This Patent Lumber is made by a Specia Machine invented by us, the ONLY Machine of its kind, and each piece will match PERFECTLY with all other pieces, by "joining" the edges to the centre, lengthwise, or any row of Diamonds.

Size of each piece, 8 feet long by 6 inches wide, and ¼ inch thick. Price 10 cents per running foot of 6 inches in width, NET CASH crated and delivered f. o. b. Chicago, in orders of not less than 6 pieces. Send for sample.

BROWN BROS. MFG. CO.

Cor. Clinton and Jackson Sts. Chicago.

PRISMATIC SIDEWALK LIGHT TILE.



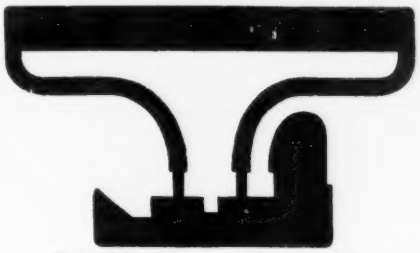
Make your own frames and we will furnish you with Tiles for either Iron or Concrete Lights. Write for prices.

BROWN BROS. MFG. CO.,

Cor. Jackson and Clinton Sts. CHICAGO.

Use Holland Core Oil

and you can make



This kind of Core made every day without vents.

Any Kind of Castings without a Loss.

???

DON'T OVERLOOK THIS ITEM.

Our representative on the road, who is a practical Core maker writes as follows:

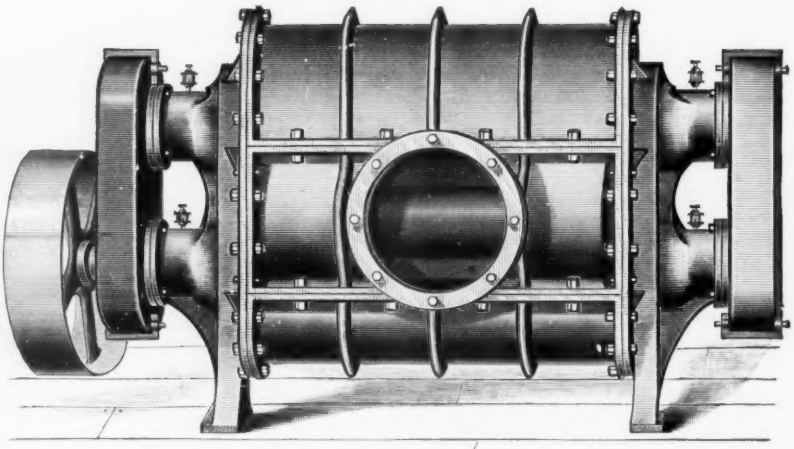
"There is nothing on the market that compares with Holland NEW Core Oil It is superior to the best Linseed Oil for making a strong porous core. I find by actual test that in using 1 1-5 parts of oil and 3 parts of flour together, for large cores, (small cores use all oil) you get a bond, and a core that works the same in castings as an all oil core, being free from blowing."

IT HAS not only held its own,
But been improved
In many ways.
It is now cheaper than flour.
Rosin, molasses, or anything else
That is employed for
Making cores.
From fifty to eighty parts of sand
Are used with one part of
THE HOLLAND CORE OIL.
Not only does
It cheapen your mixture—
It makes it better and
The loss from bad cores
Is represented by a cipher
Wherever
THE HOLLAND CORE OIL
Is employed.
The core shown in
This advertisement was
Used without being vented.
We advise the venting
Of cores, but,
Where you can't do it
Very handily, you can
Get along without vents by using
THE HOLLAND CORE OIL.
Would like to get
Better acquainted with you.
Do we get the chance?
A postal places you
In possession of
Our printed matter on the subject
Of Core Making.

The Holland Linseed Oil Co.,

683-685 Austin Avenue
CHICAGO, U. S. A.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: **Frazer & Chalmers, Inc.** CHICAGO, ILL., and BRANCH HOUSES.

"LITTLE GIANT"

Pneumatic Hammers

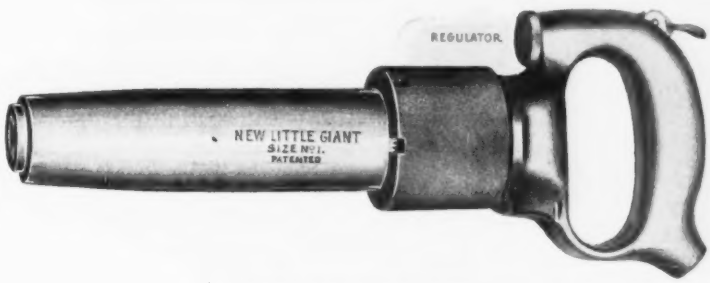
ARE ESPECIALLY DESIGNED FOR CHIPPING CASTINGS.

LIGHT. SIMPLE IN CONSTRUCTION.

DURABLE. EFFICIENT.

They have an air regulator which can be so adjusted as to admit a minimum amount of air and yet deliver a blow with full force of hammer under various pressures.

MADE IN ALL SIZES. Used in Foundries throughout the World.



SENT ON TRIAL. Guaranteed Against Repair for One Year.

SEND FOR CATALOGUE.

Standard Pneumatic Tool Co.,

Manufacturers Piston Air Drills, Boring Machines, Reversible Motor Chain Hoists, and all kinds of Pneumatic Tools and Appliances.

Main Office and Works, CHICAGO, U. S. A.

NEW YORK. LONDON. PARIS. BERLIN. ST. PETERSBURG.

No Need of Argument!

Smooth-On stops a leaky casting from leaking. It stops it permanently.

Whenever you have a casting that won't stand pressure, apply **Smooth-On,** that makes the casting as good as the best.

Some people are foolish enough to throw such castings away. Don't *you* do it!

May be a little sand fell off the mold. This will leave a hole some place where there should not be any. To remedy this so that no one will ever know it, fill the hole with **Smooth-On.** After it is dry, you couldn't pry it out with a crowbar.

Another thing, **Smooth-On** has the same color as the casting. No mark to show where it is. The whole thing may be finished just the same as a perfect casting.

Thousands of foundrymen say they couldn't keep house without **Smooth-On.** They are turning to profit what other shops charge to loss.

You should have a can of **Smooth-On** where you can lay your hands on it at any time. You won't know how handy and useful it is 'til you have tried it.

Do you want some reading matter about **Smooth-On?** A postal card addressed to us brings it.

SMOOTH ON MFG. CO.,

VREELAND TOMPKINS, CHEMIST AND MANAGER.

547-549 COMMUNIPAW AVENUE, JERSEY CITY, N. J., U. S. A.

If Perfect Castings

ARE DESIRED, USE

Our

Cherry Valley Foundry Iron.

For twenty-five years
the standard soft Iron.

CHERRY VALLEY IRON WORKS,

LEETONIA, OHIO.

THE business we have booked in '99 will keep us hustling well into 1900. We are working harder than we ever did to take care of the trade we have already got.

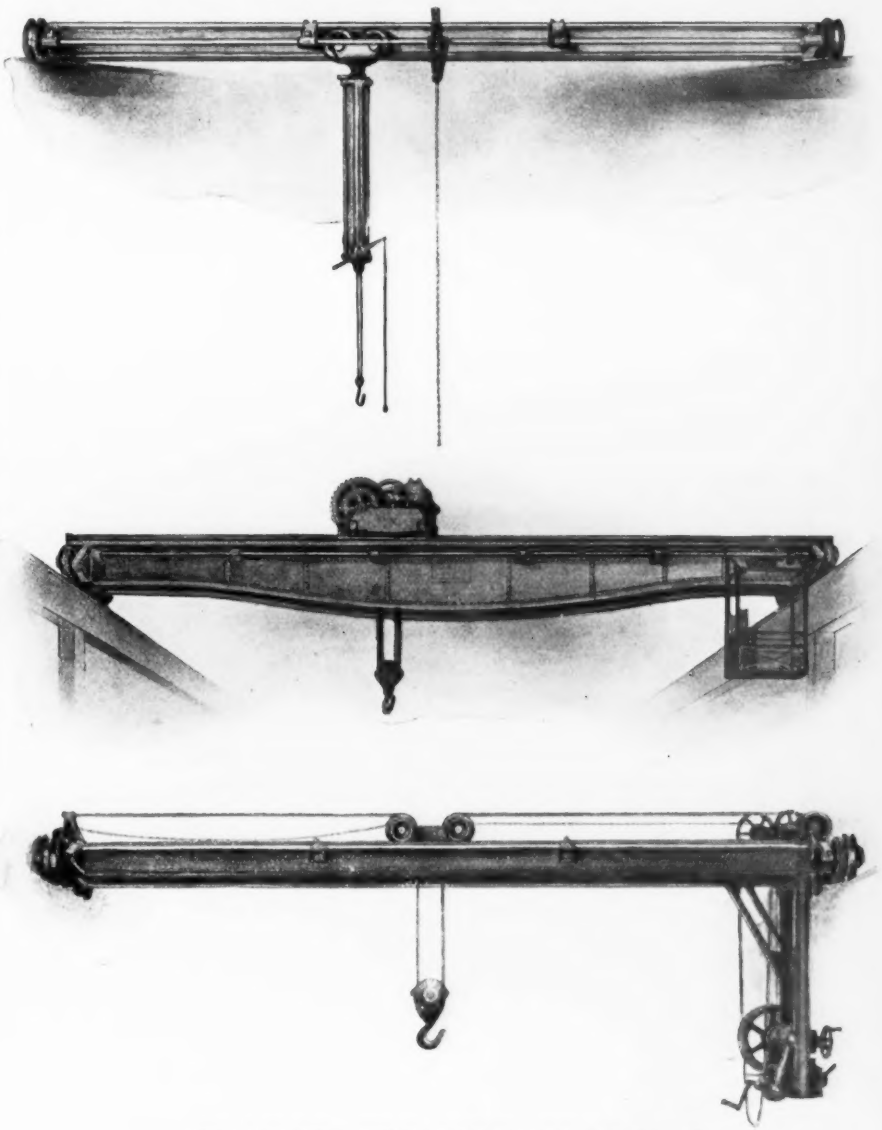
The **Zanesville Sand** that **Ayers** ships is the highest grade of Molding Sand.

How much do you want next year?

H. S. VROOMAN,
Western Agent, 220 W. 20th St. Chicago.

E. M. AYERS,
Market Block, ZANESVILLE, OHIO.

CRANES.



CRANES FOR THE FOUNDRY.

A few of our standard Electric, Pneumatic and Hand Power Traveling Cranes are shown in these cuts. We also make Jib, Pillar and other types. We will be pleased to submit designs and estimates to suit your particular needs.

NORTHERN ENGINEERING WORKS,

6 CHENE STREET, DETROIT, MICH.

Manufacturers and Designers of High-Grade Machinery and Equipment for Iron and Steel Plants, Foundries and Machine Shops.

Coreka

IS A WONDER

You Don't need Rosin ! You Don't need Oil !
You don't need Flour ! You don't need Molasses !

YOU DON'T NEED ANYTHING BUT

Coreka

IS A WONDER

To dampen the Core Sand with, to make the STRONGEST, BEST VENTED, LONGEST LASTING CORES without SMOKE or ODOR. A CORE MADE WITH COREKA WILL NOT BLOW OR SWELL.

It will rap out easily. A most satisfactory Core Mixture for the most intricate Core work.

PRICES.

Barrels	25	cts. per	Gallon.
One-Half Barrels	28	" "	"
15 Gallon Kegs	30	" "	"
10 " "	35	" "	"
5 " "	40	" "	"

INCLUDING PACKAGES.

Used by hundreds of Foundries. Full directions with shipment.

SOLE MANUFACTURERS

The J. D. Smith Foundry Supply Company,

Manufacturers Foundry Facings, Blackings, Supplies,
Refiners of Plumbago.

CINCINNATI, O., U. S. A.

EVERYTHING FOR THE FOUNDRY.

If Quality

IS DESIRED, USE

Our

Crucibles.

McCULLOUGH-DALZELL COMPANY

PITTSBURG, PA.

WRITE FOR CATALOGUE.

Whiting Foundry Equipment Co.

GENERAL OFFICE AND WORKS; HARVEY, ILL., U.S.A. (CHICAGO SUBURB.)

CHICAGO OFFICE: 1543 MARQUETTE BUILDING.

CUPOLAS
TUMBLERS
LADLES
SIFTERS

AIR HOISTS
RECEIVERS
TURNTABLES
TRUCKS, ETC.

Engineers and Designers of Complete Plants for the Manufacture of

CAST IRON CHILLED CAR WHEELS

(WHITING PATENT SYSTEM.)

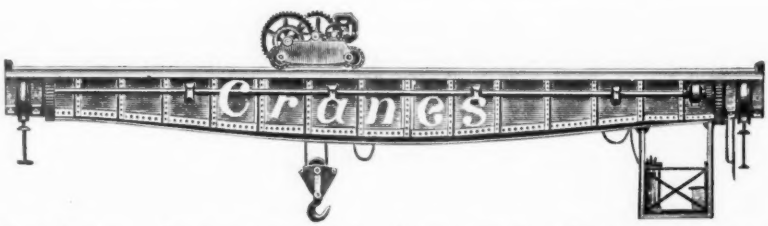
CAST IRON PIPE

(GAS and WATER.)

MALLEABLE AND STEEL CASTINGS

OUR SPECIALTY—

ALL TYPES OF CRANES.

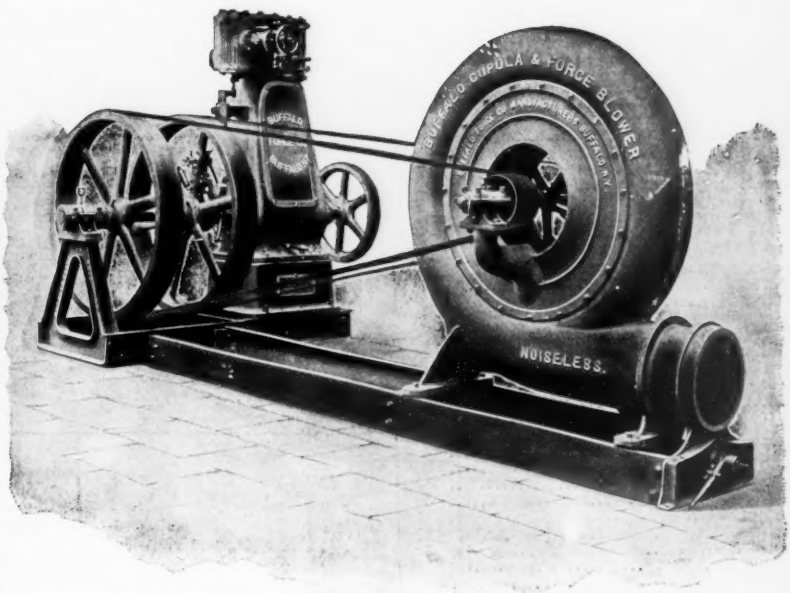


Electric, Compressed Air and Hand Power.

EXPORT BUSINESS SOLICITED. SEND FOR CATALOGS.

BUFFALO CUPOLA BLOWERS.

BUFFALO TUMBLING BARREL EXHAUSTERS.



Buffalo Steel Pressure Blower on Adjustable Bed, with Combined Engine and Countershaft.

Buffalo Forge Company,

BUFFALO, N. Y., U. S. A.

The Buffalo Fan System of Heating and Ventilating Foundries, Machine Shops, and all Large Buildings.

The Buffalo Forge Company Engine for Select Service. Highest Award and Gold Medal, Omaha, 1898.

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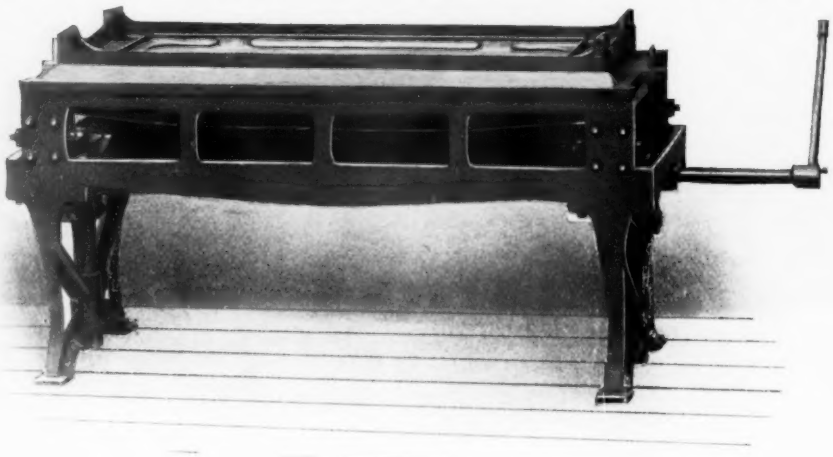

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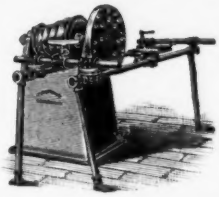

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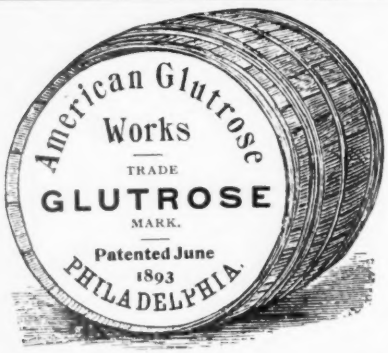

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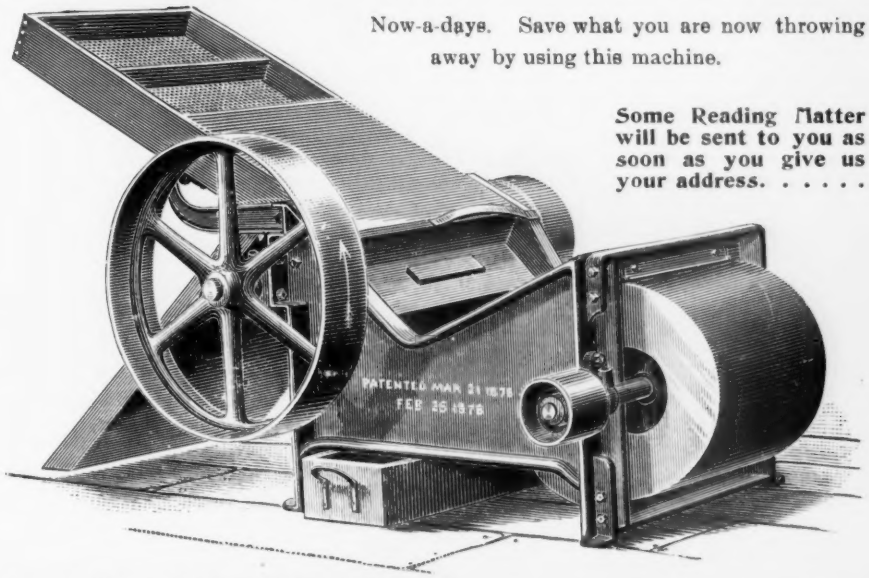

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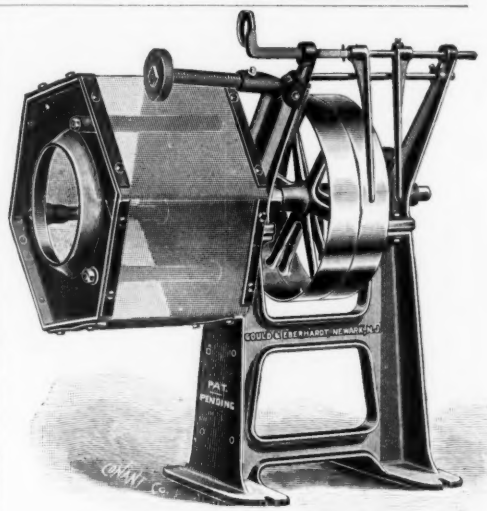

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GENTLEMEN—As to the working of the Sand Sifter, it is *more than satisfactory*. After using a shaker, which not only shook the sand, but also shook itself apart periodically, it is a great relief, doing its work *quietly* and *thoroughly*, and we shall be pleased to recommend it to anyone you may refer to us. Yours truly,

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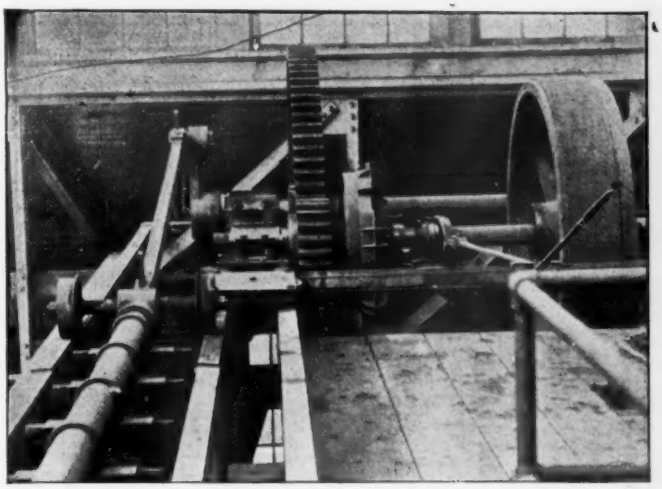

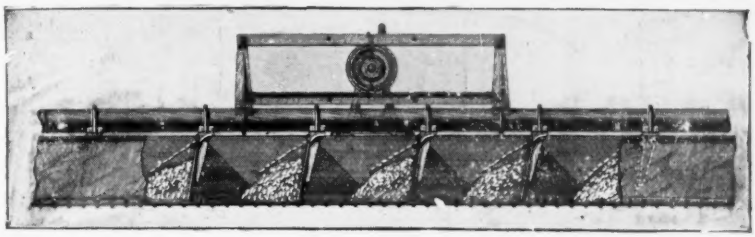

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Complete Installations.

Don't throw a Casting away because it looks bad, but is otherwise all right. If it is nothing but "bad looks" that ails a casting, you can dress it up with **Clark's "Cast Steel Cement"** so that it will look as good as the best. This Cement, as near as it can be described, is

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Upon application, it becomes as hard as the casting itself, retaining the same color and general appearance. Send us your address and we will forward price list and a sample.

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Soft, Smooth Castings and Finished Hardware Specialties to Order.

Our Leader! Hardwood Bench Rammers, 25c PER PAIR F. O. B. Newark.

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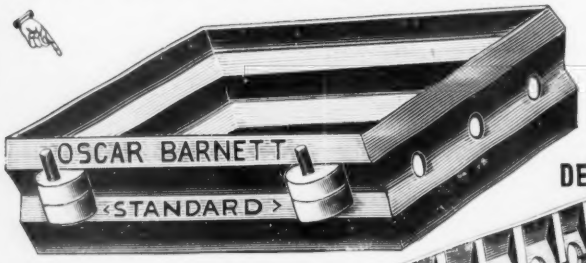

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SAME PRICE AS <STANDARD> BEVEL.

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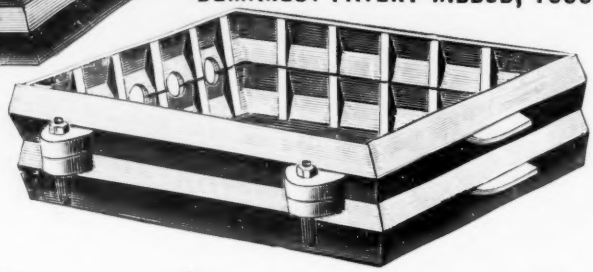

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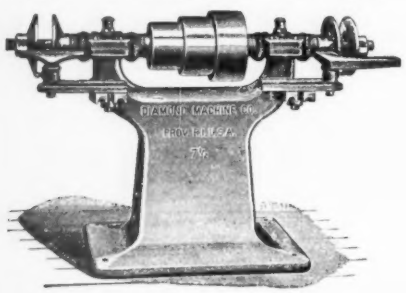

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This Grinder

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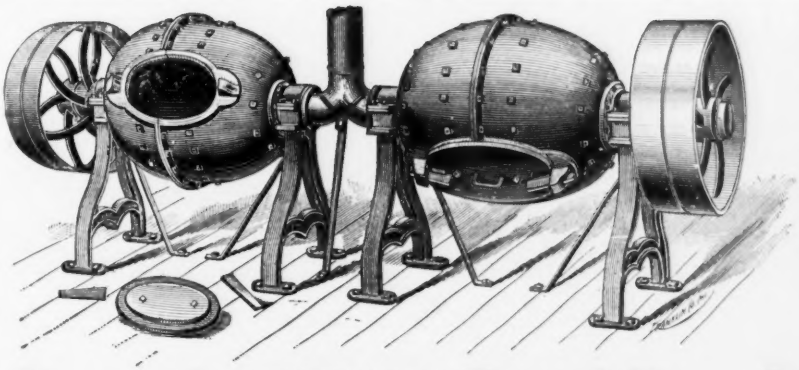

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Stover Manufacturing Co.

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THE ADAMS COMPANY, DUBUQUE, IOWA

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SO . ARE . PRICES.

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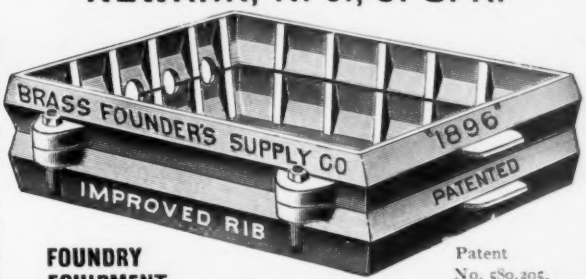

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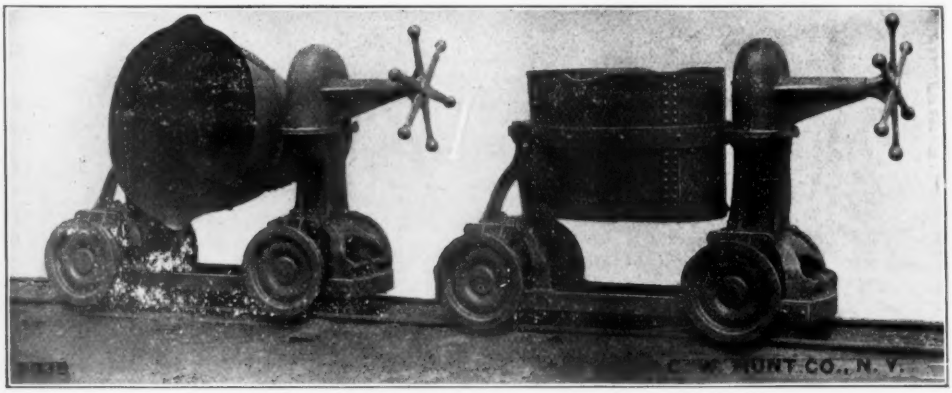

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Fluor Spar.

It is the real thing.

Having obtained clean iron you will want clean castings. Small work is generally troublesome to clean, especially if it must be nickel plated, and with our

Hydrofluoric Acid

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PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

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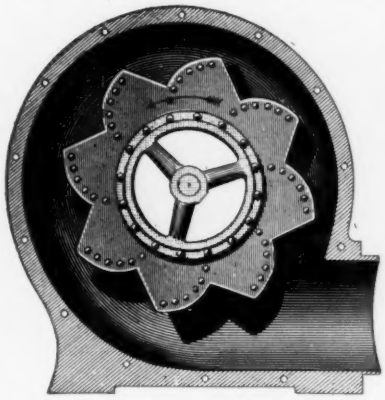

Most Any Kind

of an arrangement will cause a breeze when it is set in motion, but when it comes to handling air, and handling it economically, there is no machine that can compare with the

Poole Blower

It is so constructed that the power furnished it is delivered at the other end of the pipe. The air can not back out of the Poole Blower, like it can in fans made with straight blades.

We use the **POOLE BLOWER** in our own Foundries, melting from seventy-five to a hundred tons per day, consequently we know what it is capable of doing. We also have a string of testimonials from other people, which we would like to mail to you. They all go to show that

THE POOLE PRESSURE BLOWER

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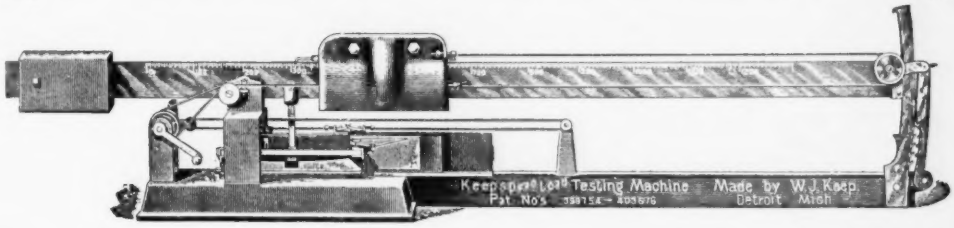

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OF A DESIRED QUALITY

AT A LOW PRICE. ✳

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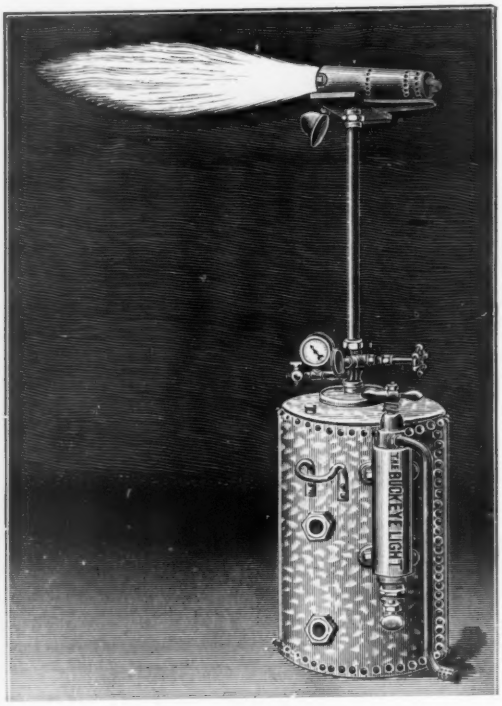

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The Only Light for Foundries.

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The cost of patterns often eclipses the cost of Molding Machines.

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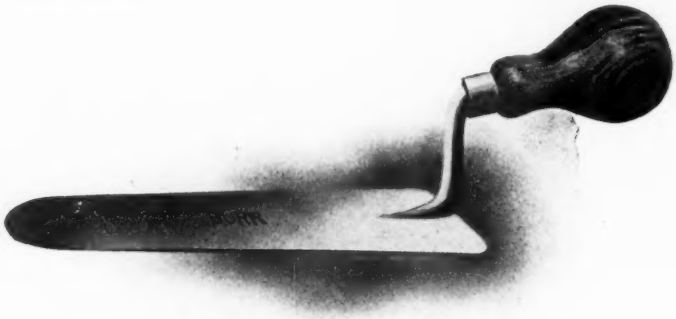

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FIRE BRICK for All Purposes.

Extra quality Fire Brick suitable for Iron Trade. Largest Stock in the State, all Shapes and Sizes.

Kiln Brick, Cupola and Furnace Blocks a Specialty.

Finest Quality Fire Mortar and Crude Clay. Shipments promptly anywhere. Send blue prints for our prices on Special Work.

STATEN ISLAND CLAY CO.,

WOODBRIDGE, N. J.

Established 1826.
Incorporated 1856.

PRESBREY STOVE LINING CO.

Manufacturers of

FIRE BRICK AND STOVE LININGS.

Office and Works, 212 Somerset Ave.,

TAUNTON, MASS.

Established 1864.

CHAS. TAYLOR'S SONS CO.,

CINCINNATI, OHIO.

Manufacturers of

FIRE BRICK for All Purposes.

Workers of

CARTER CO., KENTUCKY, CLAYS.

Telephone, Canal 267.

FIRE BRICK and MOLDING SAND,

All Grades and Shapes of Fire Brick and Cupola Block.

H. S. VROOMAN,

220 West Twentieth Street,

CHICAGO.

Time Saved is Money Saved.

Carborundum saves time.

Carborundum is the most efficient grinding material known.

It is exceedingly hard and sharp—far more so than emery or corundum.

Carborundum wheels do *more* work, and do *better* work; but of still greater importance, they do *faster* work than any other abrasive wheels made.

We have recorded cases of our wheels having done in one day the work which required five days when done with emery wheels—the labor-saving in one day having more than paid the entire cost of the wheel.

Carborundum is made into all forms of grinding and polishing materials. All guaranteed to save money to their users, and all described in our illustrated catalogue.

THE CARBORUNDUM COMPANY,
Niagara Falls, N. Y.

Telegraphic Address: "Machinery, Newport, Mon., England."

Send for Specimen Copy of

PHILLIPS' MONTHLY MACHINERY REGISTER

The Oldest Established and Most Successful Medium in the World.

Established 25 years for the purpose of introducing those who have Machinery for Sale, to those who wish to buy, has a circulation of about 50,000 copies per annum, all over the world, and is used for continual reference by a large number of firms.

It is consequently a most valuable Advertising Medium for all Engineers and Manufacturers.

Yearly Subscription { 6 Shillings, 7 Fr. 72 C. 6 Marks 50 Pf. 3 Roubles.

SUBSCRIPTION TO THE UNITED STATES:
15 cts. per copy ; One Dollar and Fifty cts. per annum.

Proprietor and Publisher,

CHARLES D. PHILLIPS, M. I. M. E.

NEWPORT, MON , ENGLAND.

Hold On.

Do not be in any hurry about your winters supply of . .

Molding Sand.

We keep at all times of the year a large stock of Dry Sand in store-houses.

We dig it, dry it, roll it, screen it. and can ship it dry at all times of the year.
No water or foreign matter to pay for.
No freezing in the cars. All pure sand.
For the highest class of castings.
Send for catalogue, samples and prices.

Standard Sand Co.,

EVERETT, Summit Co., O.

THE GARDEN CITY SAND CO.
Western Agents, - - Chicago, Ill.

DO YOU MAKE LIGHT OR HEAVY

Dry Sand and Skin Dried Work?

IF SO, YOU SHOULD USE

McCORMICK'S

VULCAN BLACKING.

It makes as clear and smooth a casting as the best plumbago and better than the silver leads. Not an experiment—in use in the largest foundries. A trial will satisfy you of its value.

MADE ONLY BY

J. S. McCORMICK CO., PITTSBURG, PA.

A GOOD THING!

That's what you are missing when you fail to use **"DOME" FIRE CLAY.** One Steel Manufacturing Company has used *fifty carloads since January 1st, 1899;* another formerly used the highest grade of Pennsylvania Clay and is now using **"DOME" CLAY** *exclusively;* and so on.

Let us send you a *free sample for test,* and put you in the way of saving over 100 per cent. on your Clay bills, *sure.*

Our Cupola Blocks, Fire Brick, Molding Sand, Fire Sand, etc., are of the most substantial kind.

Our References—any Leading Manufacturer in the Northwest. *Write us!*

GARDEN CITY SAND CO.,

LONG DISTANCE PHONE, M 5102.

188 Madison Street, CHICAGO.

Our Offering for the New Year.

PIG IRON AND COKE.

The development of foundry capacity during 1899, as shown in recent issues of THE FOUNDRY, has apparently been greater than the increased ability of blast furnaces to supply foundry irons. If the present conditions continue, some consumers will have lively times between now and July 1st, to keep themselves in iron.

In anticipation of the wants of our friends, we have greatly enlarged our list of furnace connections, and are now ready to take care of all, whatever their requirements may be. Please run your eye over the following list of brands for which we are agents.

Belfont, O.
Bellefonte, Pa.
Bristol, Tenn.
Carnegie, Tenn.
Charlotte, Pa.
Cherokee, Ga.
Crane, Pa.
Embreeville, Tenn.
Greensboro, N. C.
Globe, O.
Hecla, O.
Henry Clay, Pa.
Hinkle, Wis.
Iroquois, Ills.
Jefferson, Texas.
Lincoln, O.
Macungie, Pa.
Mannie, Tenn.
Madison, O.
Milton, O.
Napier, Tenn.
Niagara, N. Y.
Nittany, Pa.
Olive, O.
Oxford, Pa.
Punx'y, Pa.
River, O.
Salisbury Carbonate, Conn.
Shenandoah, Va.
Star, O.
Talladega, Ala.
Tonawanda, N. Y.
Topton, Pa.
Trussville, Ala.
Warner, Tenn.
Watts, Ky.
Wellston, O.
Williamson, Ala.
Vanderbilt, Ala.
Victoria, Va.

We are prepared to furnish numerous other standard brands of Pig Iron.

We represent the best makes of 72-hour Foundry Coke in all the coke-producing districts.

ROGERS, BROWN & CO.,

CINCINNATI. NEW YORK. CHICAGO. BUFFALO. PHILADELPHIA.
PITTSBURG. CLEVELAND. BOSTON. ST. LOUIS. BIRMINGHAM.

Pure East India Plumbago . . . .

SILVER LEAD, GRAPHITE.

Guaranteed to be Absolutely Pure and Unadulterated.

Let us send you a Sample Barrel, and if not as represented return to us at our expense.

. . . . THE . . . .

S. Obermayer Co.

CINCINNATI, O.
CHICAGO, ILL.

Write for General Catalogue No. 26.

Seal Coal Facing.

Bituminous Facing.

CAR LOADS OR LESS—IN BAGS OR BBLS.

Guaranteed to be ground fine and uniform, go further in use and produce better results than any others.

LET US QUOTE PRICES.

Say Nothing but Saw Wood

THIS is an old saw, and it may be all right, theoretically, but not in practice. It is our habit of everlastingly saying something that may impel you to drop a nickel or two in the slot and get a tonic for your sick Cupola in the shape of a well made, fire-resisting, friction-withstanding Cupola Block.

Our Obermayer Cupola Block (size 12x6x6) bears the saw marks of success, and money invested in a lining made by us is as good as the same amount let out at 20% interest.

Our Blocks cost you nothing if not satisfactory. Try them. Any size in stock at Cincinnati, Chicago and Works—Oak Hill.

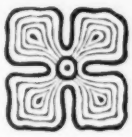
We make everything in the way of Fire Brick.

The S. Obermayer Co.,

CINCINNATI Works—OAK HILL CHICAGO

Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.



CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

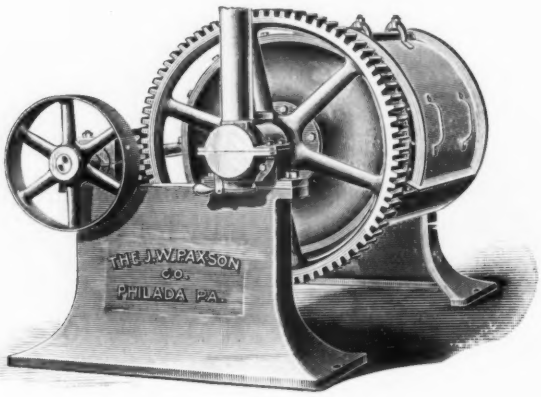
Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

Joseph Dixon Crucible Co.

JERSEY CITY, N. J.

Paxson Exhaust Rumblers

MADE OF STEEL.



MADE IN SIZES:

18	inch	diameter,	any	length	from	24	inch to	48 inch.
24	"	"	"	"		30	"	48 "
30	"	"	"	"		36	"	54 "
36	"	"	"	"		36	"	54 "
40	"	"	"	"		36	"	60 "

No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

NEW

Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

LOCATION AND AREA OF TUYERES INSURE THE HIGHEST MELTING . . . EFFICIENCY. . . . . .

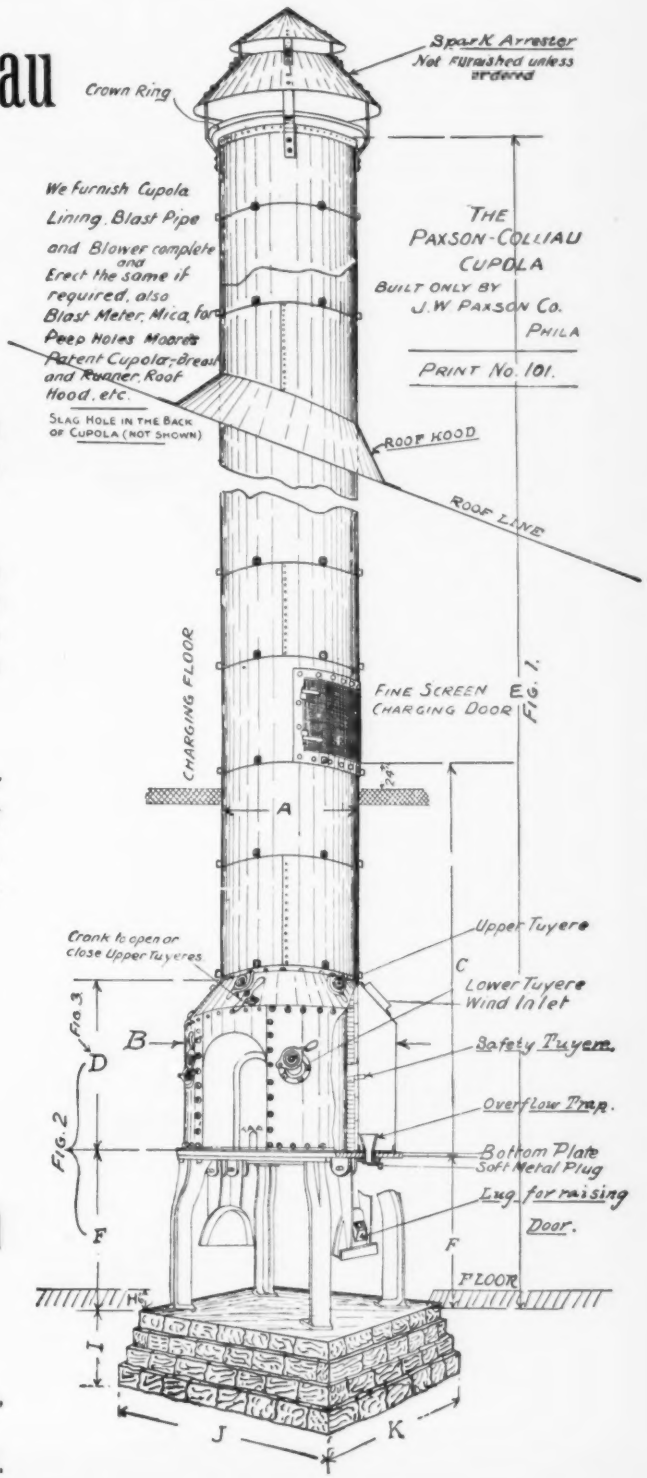
It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

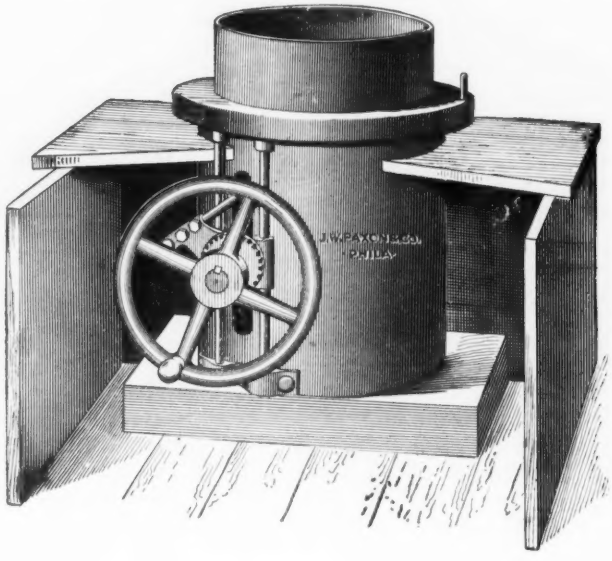
J.W. Paxson Co.

1021 . . .
North Delaware Avenue,

PHILADELPHIA, PA., U. S. A.



Paxson Pulley Molding Machine.



ANY SIZE CAN BE MADE TO ORDER.

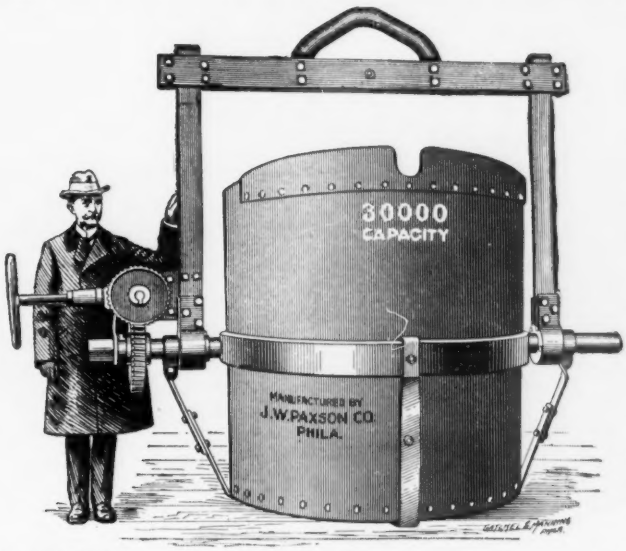
4 inch. to 12 inch Machine.	48 inch to 60 inch Machine,
12 inch to 24 inch "	60 inch to 72 inch "
24 inch to 36 inch "	72 inch to 84 inch "
36 inch to 48 inch "	

This Machine will only make a *Flat* Face Pulley, but a Crown-Faced Pulley can be made by making a collar of required thickness and placed on the Pattern around the rim.

ASK FOR PRICES.

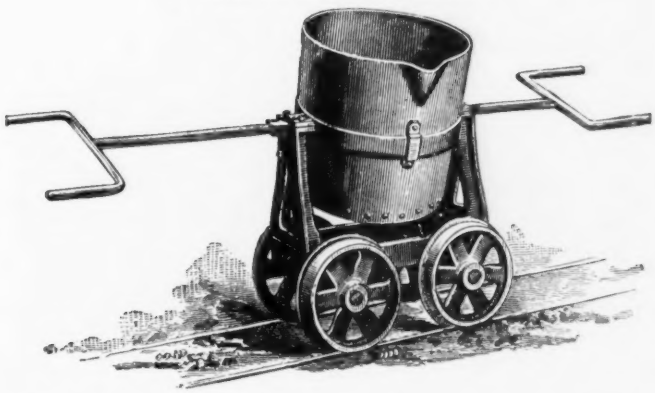
J. W. Paxson Co., 1021 North Delaware Ave., PHILADELPHIA, Pa.

Large Crane Ladles WORM GEARED



No. A—GEARING No. 1—BAIL No. 1—LIP

TRUCK LADLES



Made in all sizes and styles from 50 lb. to 30,000 lb. capacity.

ASK FOR PRICES LARGE STOCK ON HAND

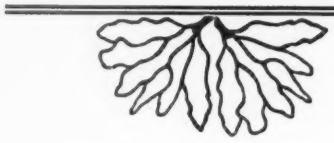
MADE BY

J. W. Paxson Co. 1021 North Delaware Ave., PHILADELPHIA, PA.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

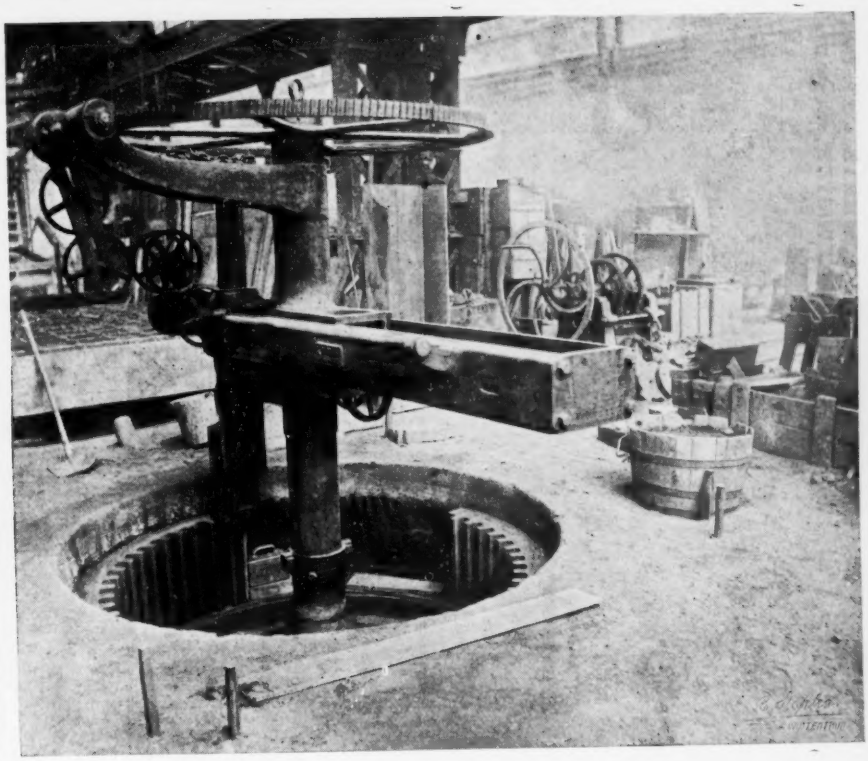
537=39 *West 27th St.,*
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.



Machine Molded Gears

will have smooth teeth if the mold is finished with the **C. F. M. Perfect Wash.** The rough surface and the great amount of chipping, scraping and filing often witnessed on this class of castings, could be done away with if their makers would use our **Perfect Wash.** While we call it a **Wash,** on account of it first being used for heavy loam and and dry sand castings; we want to say that it is as **Perfect** for green sand work as it is for loam or dry sand. Rubbed on with the hand or a camel hair brush, the **C. F. M. Perfect Wash** always leaves its own trade mark in the shape of an easily cleaned, smooth casting.

The Cleveland Facing Mill Co.

FRANK H. CHAMBERLIN, Proprietor. **CLEVELAND, OHIO.**

Have you had a piece of our **PERFECTION CORE BOX?** The only thing to use for straight and chambered cores. Comes in all lengths and diameters at a price but little above the cost of pattern lumber.

M. M. COCHRAN, PRES.
J. R. LAUGHREY, VICE-PRES.

JNO. H. WURTZ, SECY.-TREAS.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. **5000 Tons Daily Capacity.**

300 30-TON COAL CARS — 50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

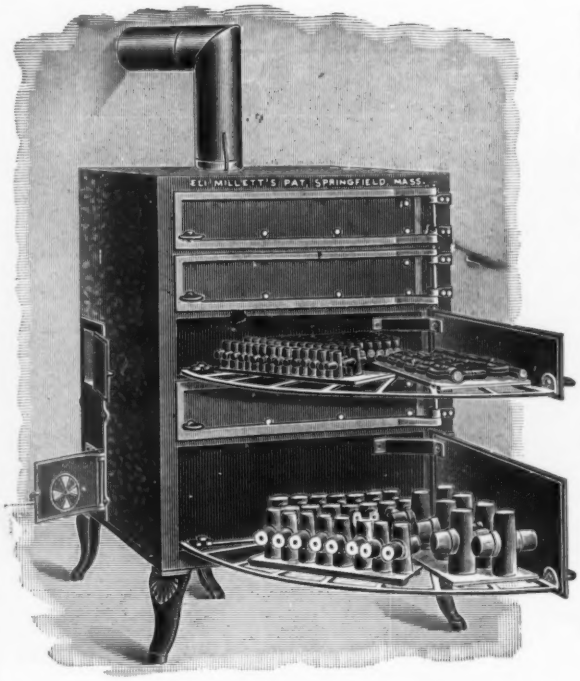
We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO. ILL.

You are doing .....



heavy and light work under the same roof. Your coremakers make cores during the day and at night when the oven is full and the carriage shoved in, the big doors are pulled down, the fire lighted and the next morning—you have your cores.

When the morning comes, haven't you sometimes found, that several small cores were burned, or may be one of the boys let a plateful of them drop and go to smash? What did you do then? Spoke rather sternly, told the boy to hustle around and make some more, told him to take them right over to the boiler, the only place you had to dry them in a hurry.

Along in the afternoon you keep bothering the Engineer, and finally when you have got to put the blast on, you set a lot of half dried cores in your molds and risk it with the result that the next morning you are in the same fix as you were the morning before.

Now, Mr. Foundryman, why don't you get the Oven we show on this page. You can put it in a corner of your shop, where you now have a lot of trash that would be as well off out doors. This Oven will dry **all your small cores,** dry them right, dry them at all hours of the day. The small amount of fuel consumed is nothing compared to the castings you save.

When you have this Oven you won't have to give your customers excuses, you can give them their work on time. That is the experience of leading foundrymen, of whom we shall be glad to send you a list. Some of them may be in your own neighborhood.

The J. W. Paxson Co., of Philadelphia, and The S. Obermayer Co., of Cincinnati and Chicago, have our Ovens on exhibition. Step in and see 'em when you have a few minutes to spare, or write us for printed matter illustrating them.

Millett Core Oven Co.,

Brightwood, Mass.

Don't Pick Up

The first thing you come to and try to make a Brass Furnace out of it.

There is nothing in it. We know it has been done and that a lot of old scrap, together with a few fire brick, may be thrown together in such a way as to melt brass, but such a collection is not a Brass Furnace in the real sense of the word.

When the brick piers of such a furnace begins to fall down; when your men have got to monkey around a couple of hours each morning to put the thing on its feet; when the draft is obstructed and you are kind of blaming the weatherman for your troubles, then you are beginning to pay interest on that cheap furnace of yours, and this interest soon amounts to more than the original cost.

The ***Millett Brass Furnace*** is built on lines approved by experience. There is no guess work about it. When you put in a ***Millett Brass Furnace*** you are sure that you have something that will melt brass in all kinds of weather; a furnace that will give your molders metal as fast as they can take care of it. These gentlemen will have no excuse for not getting out a full day's work.

Then, again, the ***Millett Brass Furnace*** is built to last. It will not fall down just when you can least afford it. We would like to have you become acquainted with it. Will you not drop us a line for our booklet?

Millett Core Oven Co.,

BRIGHTWOOD, MASS., U. S. A.

DIRECTORY OF LEADING PIG IRON DEALERS.

HUGH W. ADAMS & CO.,

PIG IRON MERCHANTS,

15 Beekman Street,

NEW YORK.

85 Water St., Boston.

MATTHEW ADDY & CO.

CINCINNATI, ST. LOUIS.

Agencies,

Chicago, Detroit, New York,

Philadelphia. Pittsburg.

DAYTON COAL & IRON CO.

(Limited)

PIG IRON,

Dayton, Tenn. Cincinnati, Ohio.

DECAMP BROS. & YULE,

Pig Iron and Coke.

Sole Agents McNair & DeCamp's

MISSOURI

MALLEABLE BESSEMER PIG IRON.

Fullerton Building, St. Louis

THE DOMHOFF & JOYCE CO.

PIG IRON and COKE.

702 Fisher Building,

CHICAGO. CINCINNATI.

F. A. GOODRICH & CO.

Incorporated

PIG IRON, STEEL, COKE, ETC.

Detroit, Mich.

M. A. HANNA & CO.

COAL, IRON ORE

and PIG IRON.

Cleveland, Ohio.

THOMAS A. MACK,

PIG IRON,

Cincinnati, - - Ohio.

J. J. MOHR.

Foundry, Forge, Charcoal and

Bessemer

PIG IRON,

Bullitt Building, Philadelphia, Pa.

C. L. PEIRSON & CO.

PIG IRON and COKE.

Foundry Mixtures a Specialty.

BOSTON. NEW YORK

PICKANDS, BROWN & CO.

Manufacturers, Importers

and Dealers in

PIG IRON AND IRON ORE.

Rookery Building, CHICAGO.

PILLING & CRANE.

PIG IRON and COKE,

Carnegie Building,

PITTSBURG, PA.

Girard Building,

PHILADELPHIA, PA.

ROGERS, BROWN & CO.

CINCINNATI, CHICAGO,

BUFFALO,

PHILADELPHIA, NEW YORK,

ST. LOUIS

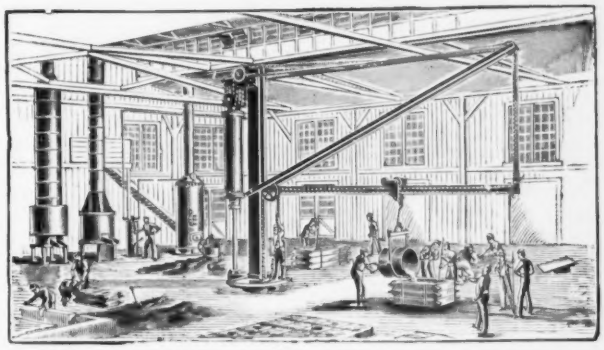
PITTSBURG, CLEVELAND.

STEVENSON, FIELD & CO.

PIG IRON and COKE,

Columbus, O. St. Louis, Mo

Craig Ridgway & Son Company.

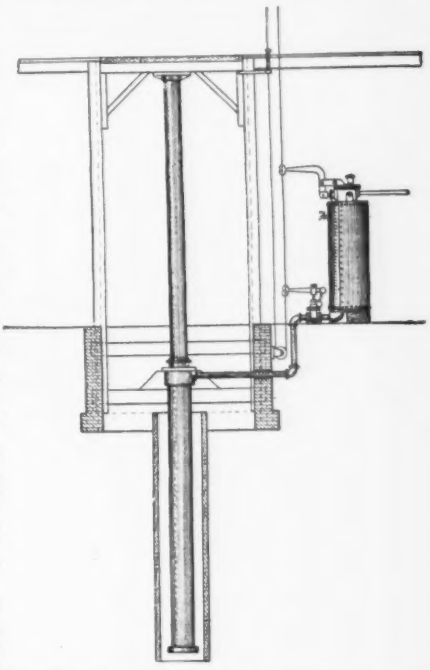


5-Ton Steam Hydraulic Crane in a Foundry.

This is the way of it now, henceforth, forever.

Just a family arrangement, however, for convenience and perpetuity,

A father and his boys. Years ago in the dark days of the war a farmer dropped his plow and bought a little Foundry and Machine Shop here in Coatesville. Those of us who were alive were little shavers then. But we grew up almost under the same roof as the shop. Craig Ridgway is the father, still active in business. His boys are William, Andrew, Ellis and Sluss, and these make the "Company." William is the oldest. When he got out of college he began to invent things—Water Wheels, Cranes and the like. He naturally wants to sell the things he invents, so he talks a great deal about them here and elsewhere. 'Spect you would call him the Sales end of the concern. Andrew, the next brother, is a practical fellow. He is out in the shop and sees that things are made about right. Ellis is the drawing-board man, the engineer, designer or what you choose. Sluss is the "baby" and has Dr. to his name, ornamental part. Over all is the Father.



So you see when you get anything from this shop, Ridgway is written all over it. People who know us say, "When you get anything from the Ridgways you can depend upon it being good and all right." That's the kind of a reputation we like and work for. We always have bought the best of everything in the material line, and as we take our work to bed with us, things we make are the best there is of their sort. We want people to come to us when they want things real good.

Now take the matter of Cranes, Elevators and Air Hoists. Hundreds of the readers of this card have one or other or all of these machines, and some of you have had them a long while, haven't you? Say, how have they turned out for you? Always ready for business when you are, eh? No repairs, no trouble and great money makers!

Well, here's Happy New Year's to you. There are other people, growing fewer every year, however, who don't have the happiness you have because they do not yet have the Ridgway & Son Company's great money makers. They will have them after a while, though, as soon as they find out about them.

"PLEASE TAKE THE ELEVATOR."

Like the Rest of the World are Doing.

CRAIG RIDGWAY & SON CO., COATESVILLE, PA.

EUROPEAN AGENT,

CHAS. G. ECKSTEIN, 16 Spandauerstr., Berlin, Germany.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.
ECONOMICAL.
EXPEDITIOUS.

NOTE.--In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing molding sand, facing sand,** and **core sand**, we have issued a small pamphlet which will be sent on application.

Among late Purchasers are :

American Radiator Co., Buffalo, N. Y.
American Radiator Co., Titusville. Pa.
National Malleable Castings Co., Indianapolis, Ind.
National Malleable Castings Co., Cleveland, Ohio.
Fischer Foundry & Machine Co., Pittsburg, Pa
R. Hoe & Co., New York.
U. S. Arsenal, Rock Island, Ill.
Michigan Malleable Iron Co., Detroit, Mich.
New York Air Brake Co., Watertown, N. Y.
Norfolk & Western R. R., Roanoke, Va.

And YOU would find as they have found, that it is one of the most valuable machines you can put in your Foundry.

Correspondence Is Solicited.

ROOTS' BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS

BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

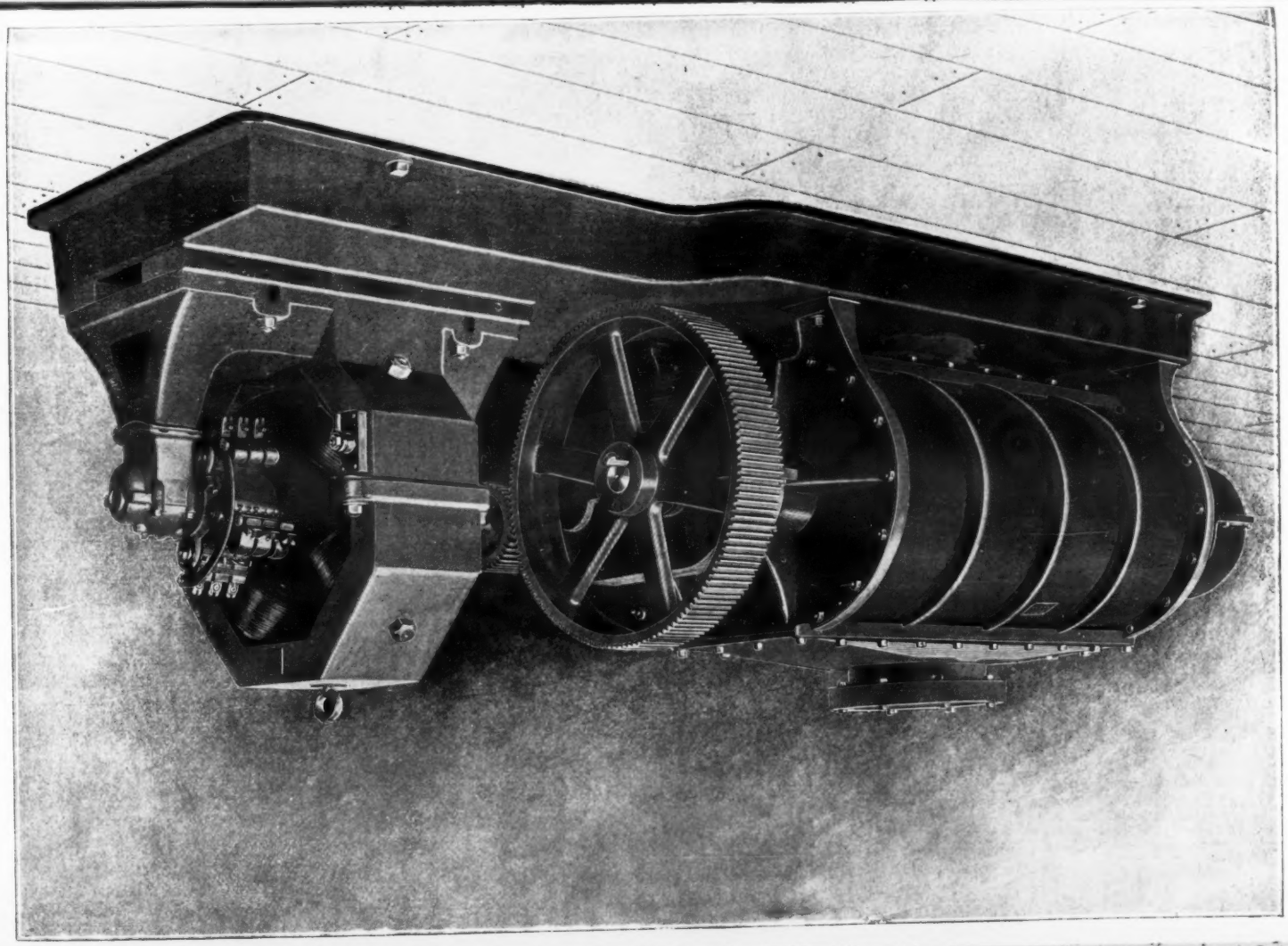
THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

C. H. BRADLEY, JR. & CO.,
Vandergrift Building,
PITTSBURG, PA.

EDMUND A. FORDYCE,
156 Lake Street,
CHICAGO, ILL.



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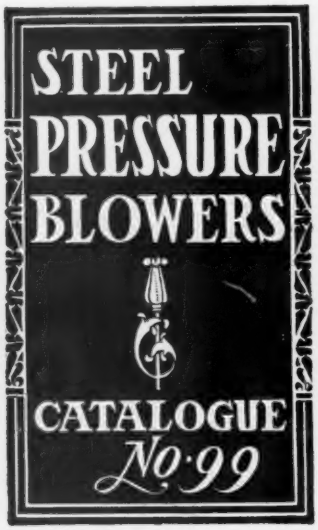

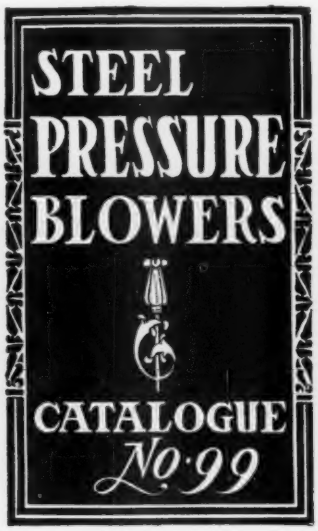

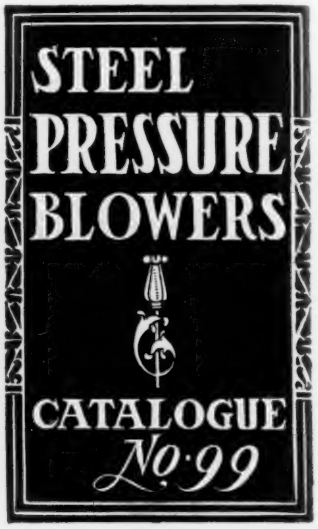

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of FOUNDRY BLOWERS

SHOWING SUPERIORITY
of FAN BLOWER OVER
ROTARY BLOWER

B. F. STURTEVANT CO.

BOSTON, MASS.

NEW YORK PHILADELPHIA CHICAGO LONDON

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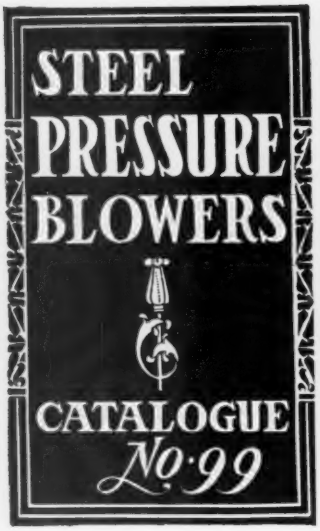

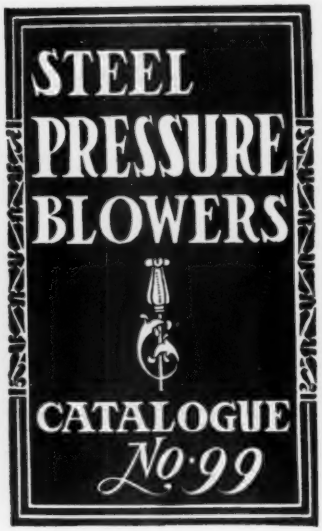

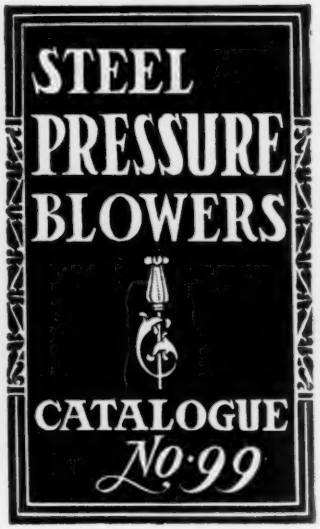

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ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

ROSS MEEHAN FOUNDRY CO.
CHATTANOOGA, TENN., May 5, 1896.

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y, & Treas.

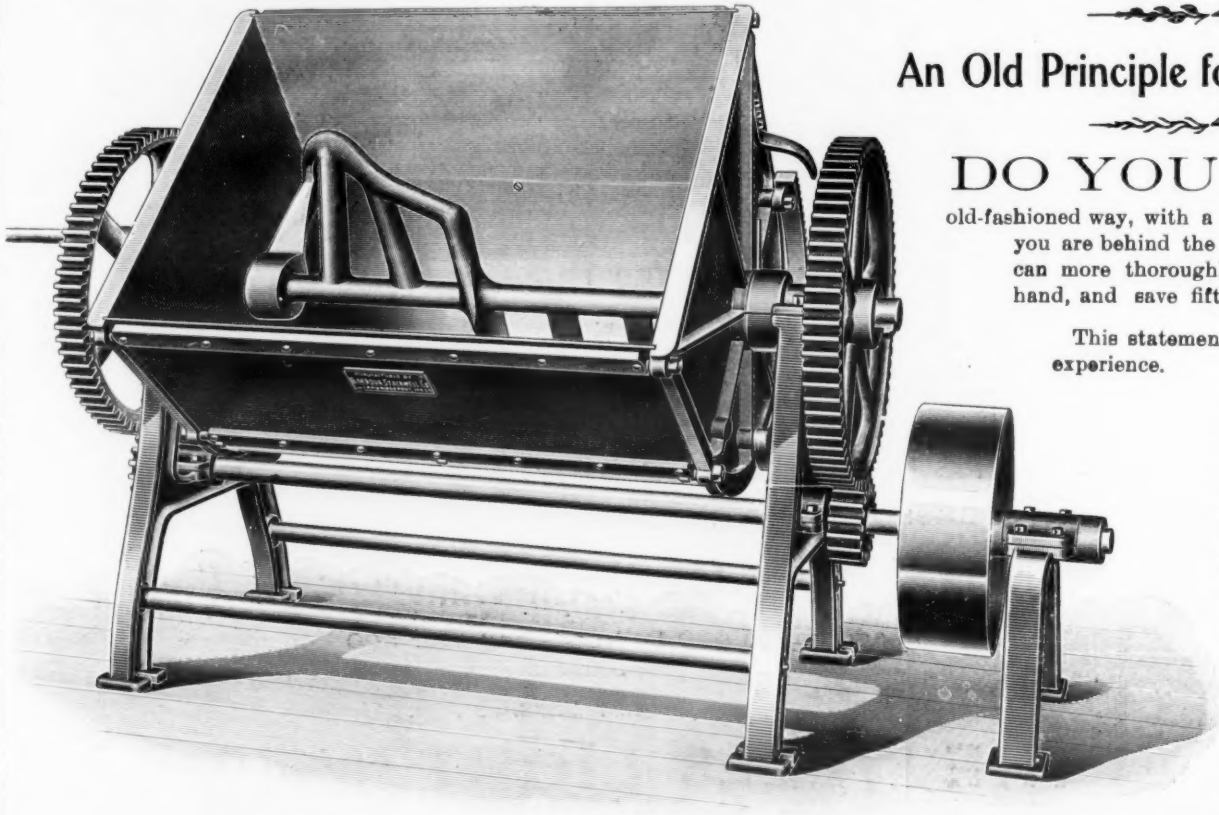
REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

BOSTON FOUNDRY MIXER.



An Old Principle for a New Purpose.

DO YOU mix your facing sand, core sand, fire clay, etc., in the old-fashioned way, with a laborer and a shovel? Then you are behind the times. With this mixer, you can more thoroughly mix it than is possible by hand, and save fifty per cent. of your labor.

This statement can be verified by actual experience.

The material is shovelled into the machine or fed in through a hopper, after riddling. The machine is then started, and in five minutes the mass is perfectly mixed. Turning a crank at the side cants the machine and empties the material either on the floor or into a receptacle provided.

Capacity, 250 lbs. every five minutes.

Pulley, 24 in. diam. x 6 in. face.

Floor Space, 7 ft. x 3 ft.

Speed of Pulley Shaft, 125 revolutions.

Weight, 1250 lbs.

For further particulars, write

BARBOUR-STOCKWELL CO., 205 BROADWAY, CAMBRIDGEPORT, Mass.

Here We Are, Beginning

THE last year of the Century, and a good many foundrymen are still lugging their iron, castings and molding sand around by main strength and awkwardness.

Of course, some of them don't know that these things can be moved any other way. That is the reason we get up these little monthly sermons.

We will suppose you are one of the foundrymen utilizing humanity for motive power. Have you ever thought of how much it costs you simply to move things?

Do a little figuring on this subject. Then suppose that you could put in a contrivance by which a man could move four times the load he did before. In that case your cost of shop transportation would be reduced 75 per cent., would it not?

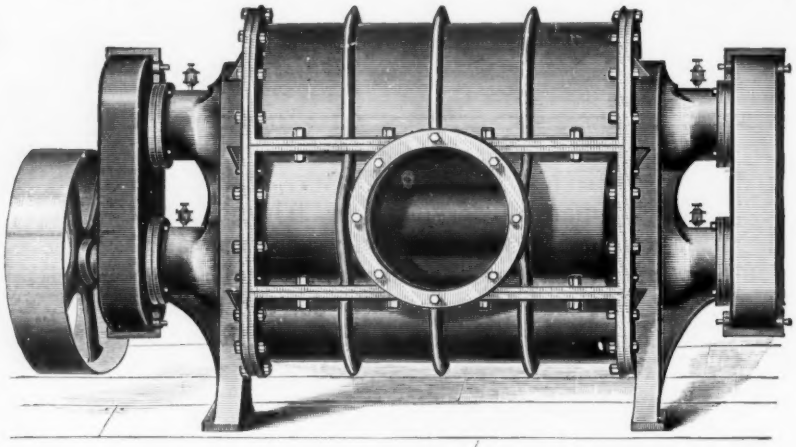
Would you consider a proposition to make such a saving? We are making this offer every month. All that you have got to do is to put a **Coburn Trolley Track** into your shop and the thing is done. This Track doesn't cost as much in the first place; it does not get out of order; it interferes with nothing; it can be applied to any form of shop construction.

Can't we get a chance to tell you what we can do for you? A few lines from you to the effect that you are willing to investigate the merits of the **Coburn Trolley Track** will result in showing you just what we have done for others.

COBURN TROLLEY TRACK MFG. CO.,

HOLYOKE, MASS.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: **Frazer & Chalmers, Inc.** CHICAGO, ILL., and BRANCH HOUSES.

Don't Straddle the Question

SOME of your castings are not perfect. Just a little something, like a sand-hole or small blow-hole, that gives your customers a chance to kick.

You don't like to throw the casting away. That would knock the profit off the job.

How are you going to save your defective casting and satisfy your customer at the same time?

Simple enough. Get a can of ***Smooth-On***—the scrap saver. Fill the imperfections in the casting with ***Smooth-On,*** and nobody can tell it from a casting that was perfect in the first place.

Thousands of foundrymen are doing this without hollering about it. Guess you can see the reason. The majority do not believe in giving a good thing away.

Will you write us, for our story boiled down ?

Now, Foundrymen, we are going to talk to you on another subject. You know that at times you have turned out castings that you were really ashamed of, at the same time you did not know how to do better. When your customers complained of your castings being hard, spongy or lacking in some of the qualities they were supposed to possess, all you could do was to shake your head and say you couldn't tell how that could be so.

You told the truth. You didn't know. The cause may have been in your last shipment of iron being low in silicon. Again, the coke may have been high in sulphur. There may have been other causes. The only way to find out is to have these materials analyzed. When in trouble—when you don't know what ails your castings—write us. We will put you on your feet in short order. Our Laboratory will show you just where your mistakes occurred.

SMOOTH ON MFG. CO.,

VREELAND TOMPKINS, CHEMIST AND MANAGER.

547-549 COMMUNIPAW AVENUE, JERSEY CITY, N. J., U. S. A.

Are your Castings Hard,
Is your Mixture Satisfactory and
Do you carry as much Scrap as you would like ?

?

Cherry Valley

Foundry Iron

will help you.

For twenty-five years
the standard soft Iron.

TRY IT.

Can make prompt shipment.

CHERRY VALLEY IRON WORKS,

LEETONIA, OHIO.

"LITTLE GIANT"

Pneumatic Hammers

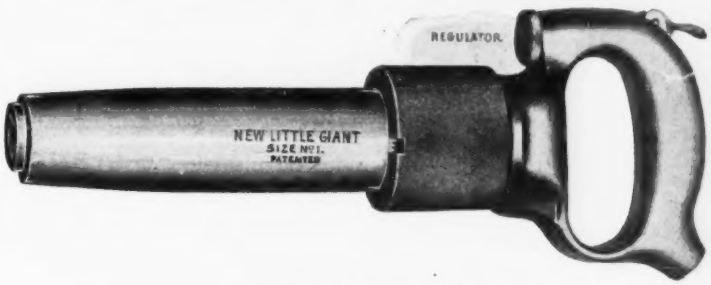
ARE ESPECIALLY DESIGNED FOR CHIPPING CASTINGS.

LIGHT. SIMPLE IN CONSTRUCTION.

DURABLE. EFFICIENT.

They have an air regulator which can be so adjusted as to admit a minimum amount of air and yet deliver a blow with full force of hammer under various pressures.

MADE IN ALL SIZES. Used in Foundries throughout the World.



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Manufacturers Piston Air Drills, Boring Machines, Reversible Motor Chain Hoists, and all kinds of Pneumatic Tools and Appliances.

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FOUNDRY SUPPLIES AND SPECIALTIES.

LATEST AND BEST.

NOTE THE NAME:

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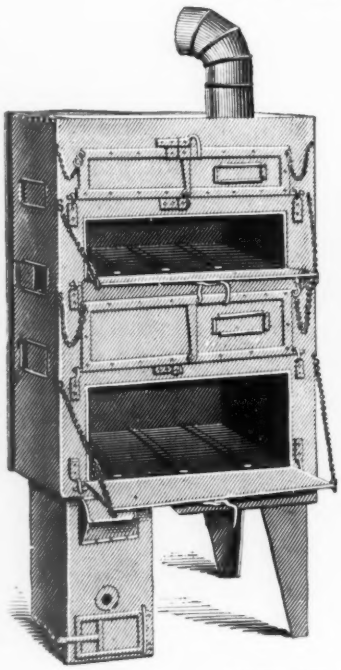
IMPROVED RIB FLASK.

The Brass Founders Supply Co.,

NEWARK, N. J.

WE ARE SPECIALISTS.



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CORE OVEN.

ROUND SHAPE.
Diameter of Mouth, 15 Inches.

BRASS FURNACE.

If Quality

IS DESIRED, USE

Our

Crucibles.

McCULLOUGH-DALZELL COMPANY

PITTSBURG, PA.

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CHICAGO OFFICE: 1543 MARQUETTE BUILDING.

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TRUCKS, ETC.

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CAST IRON CHILLED CAR WHEELS
(WHITING PATENT SYSTEM.)

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(GAS and WATER.)

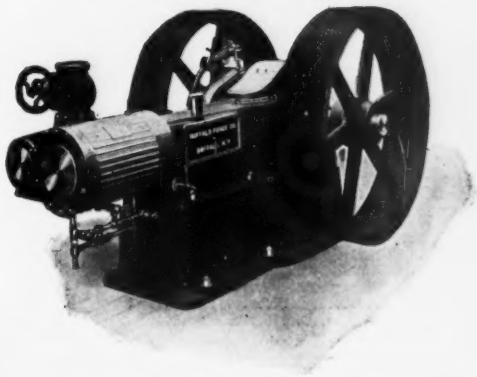
MALLEABLE AND STEEL CASTINGS

OUR SPECIALTY—

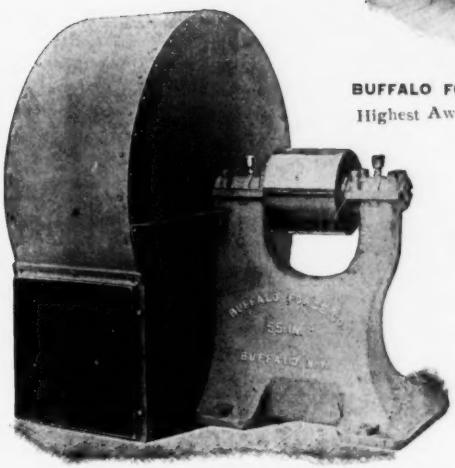
ALL TYPES OF CRANES.

Electric, Compressed Air and Hand Power.

EXPORT BUSINESS SOLICITED. SEND FOR CATALOGS.



BUFFALO FORGE CO., AUTOMATIC ENGINE.
Highest Award and Gold Medal at Omaha, 1898



BUFFALO TUMBLING BARREL EXHAUSTER.

Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

Send for details.

Our 400 Page Catalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

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Buffalo Forge Company,

BUFFALO, N. Y.

BUFFALO CUPOLA BLOWER.

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has but one rate. No reduction to Advertising Agencies.

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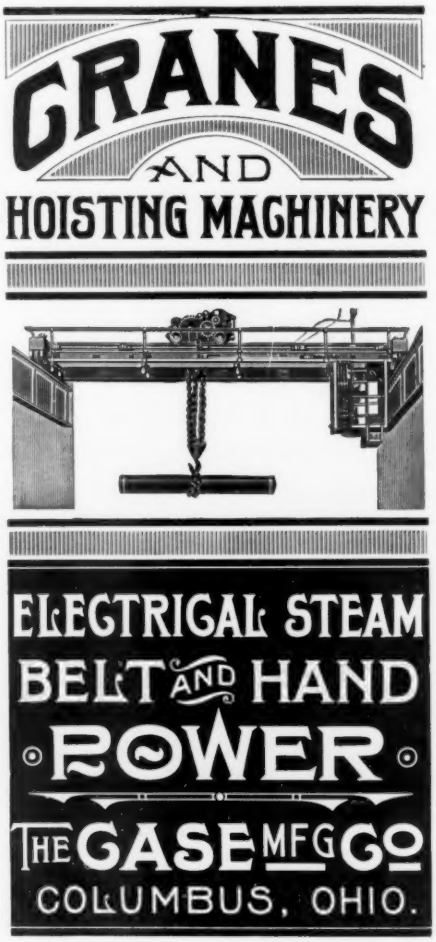

CRANES.

The cut shows our standard three motor Electric Traveling Crane. We make modifications of this design also. We sometimes substitute straight girders where needed. We make also a double trolley crane. Get our Catalog No. 11.

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4 CHENE STREET, DETROIT, MICH.

Designers and Manufacturers of High-Grade Cranes and Equipment for Foundries, Steel Plants and Manufacturing Establishments.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

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"CLINTON" AND 'HECTOR"

INSPECTED FOUNDRY IRONS ....

ALSO

Sole Factors for DUNBAR STRONG IRON

In New York and New England.

FURNACES, PITTSBURGH.

NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

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Brooklyn Fire Brick Works

T. K. BRICK, 1854. E. D. WHITE & CO., 1867.
INCORPORATED 1893.

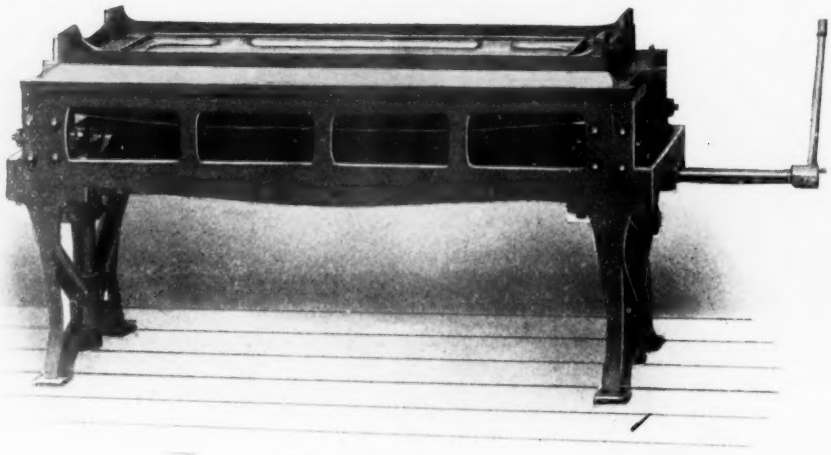
CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

88 Van Dyke Street, BROOKLYN, N. Y. CITY.

SAND MOLDING MACHINES



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THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)

CLEVELAND, OHIO

Syracuse
STEEL
Foundry
WHEELBARROWS
OF ALL KINDS.

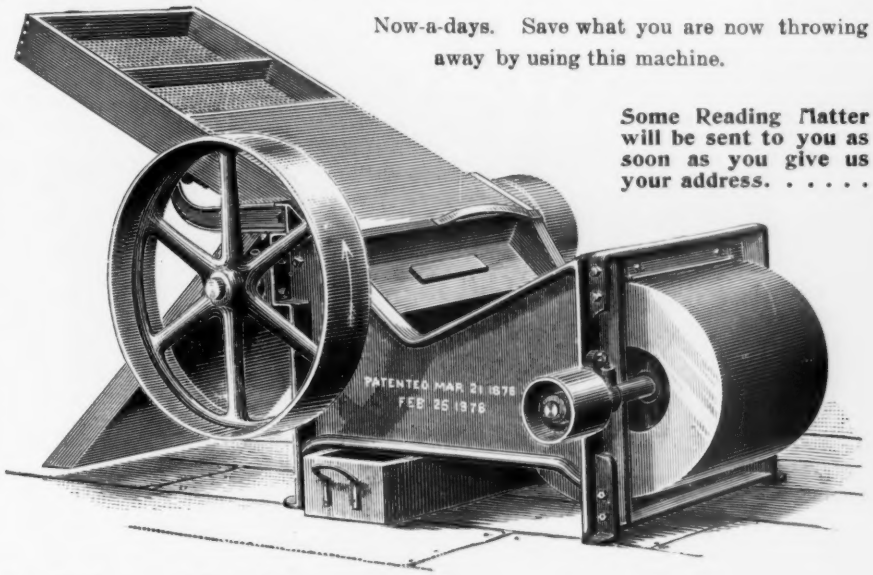
MANUFACTURED BY
SYRACUSE CHILLED PLOW CO.,
SYRACUSE, N. Y.

WRITE FOR
No. 8 F Catalogue.

IRON IS MONEY

Now-a-days. Save what you are now throwing away by using this machine.

Some Reading Matter will be sent to you as soon as you give us your address. . . . . .



Audubon Machine Works, **New Haven, Conn.**

For Sale.

The entire equipment, complete line of patterns and good will of an established Hot Air Furnace and Steam and Hot Water Heater Factory — comprising brick foundry, machine shop, engine room, ample storage and shipping room and pattern vault—now in operation and in good running order.

Located at Detroit, Mich.

This plant has unsurpassed shipping facilites, both by rail and water to all points in the United States and Canada.

Will be sold for cash or on long time for approved paper. For further information apply to A. S. MONTGOMERY, on premises, Nos. 251-269 Guoin St., Detroit, Mich.

YOUR IRON CONTRACTS

In making your contracts for 1900 for Lake Superior Charcoal Pig Iron, it would do no harm to take up the question of

"PIONEER,"
"ANTRIM,"
"ELK RAPIDS."

These three brands have given satisfaction in car and malleable work for years in the past and will continue to do so for years to come.

Superior Charcoal Iron Co

911, 912, 913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

RAILWAY MASTER MECHANIC.

Devoted to Railway Motive Power, Car Equipment, Shops, Machinery and Supplies.

Published Monthly. The handsomest railway publication in the world.
The only magazine of its kind in the United States.
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Devoted to Railway Motive Power, Car Equipment, Shops, Machinery and Supplies.
The Railway Master Mechanic contains expression of thought from the progressive, practical and wideawake railway men of the day and will be found of inestimable value to both the operating and mechanical departments of our railways.
Subscription price, $1.00 per year. Sample copies sent on application.

RAILWAY MASTER MECHANIC,
315 Dearborn St., Chicago, Ill.

THE MONTHLY OFFICIAL RAILWAY LIST.

Gives the Name, Official Position and Address of every Railway Officer in the United States, Canada, Mexico and Central America. Corrected every 30 days.

It is sent free to every railway officer whose name is in it. This gives it a PERFECT circulation.
It is used in railroad offices more than any other publication
It has been published for eighteen years, and every railroad officer in the country is familiar with it and makes use of it.
It is by far the best Advertising Medium for Rail way supplies in existence, because :
Its advertisements are more fully indexed than are the advertisements in any other similar publication.
Advertisers are given FIFTY per cent. more space than they can get in any other publicatian of the kind for the same money.
The LARGEST, MOST COMPLETE, and by far the most widely circulated publication of its kind in the world.
Subscription price, $1.00 per year. Sample copies and advertising rates sent on application.

THE RAILWAY LIST CO., 315 Dearborn St., CHICAGO, ILL.

A Good Opportunity

for a live man to step right into an established foundry and machine shop business, is offered in a town of 20,000 inhabitants, located in Wisconsin.

Transportation facilities are excellent. Besides being a lake port, there are four railroads entering the town.

The business has been established since 1868 and is in a paying condition.

A full chance is offered intending purchasers to investigate. Address,

FOUNDRY AND MACHINE SHOP,
Box 309, care The Foundry,
DETROIT.

Eberhardt's Patented Sprue or Gate Cutter

Dear Sir:—The machine fills the bill; am just delighted with it.
Yours truly,
Maryland Brass & Metal Works,
Baltimore, Md.

Price Low

AGENTS,

Manning, Maxwell & Moore, New York.

U. Baird Machinery Company, Pittsburgh, Pa.

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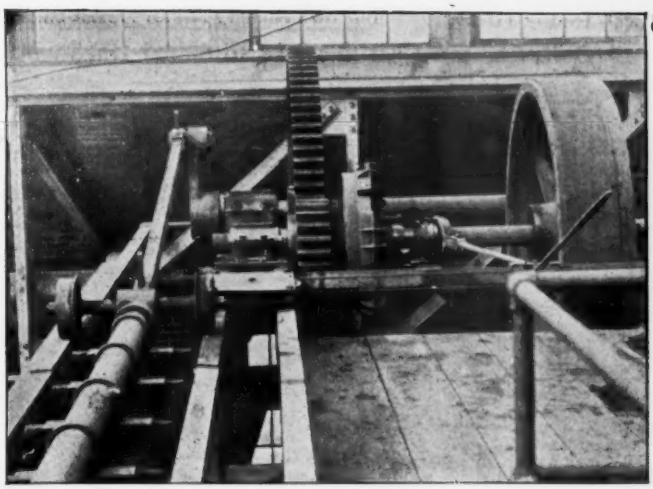
PITTSBURG, PA.

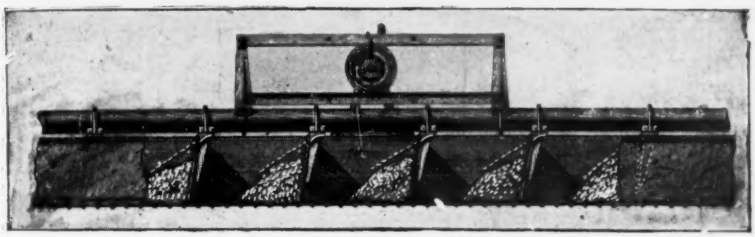
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

Don't throw a Casting away because it looks bad, but is otherwise all right. If it is nothing but "bad looks" that ails a casting, you can dress it up with **Clark's "Cast Steel Cement"** so that it will look as good as the best. This Cement, as near as it can be described, is

CAST IRON IN A PASTE FORM

Upon application, it becomes as hard as the casting itself, retaining the same color and general appearance. Send us your address and we will forward price list and a sample.

D. N. CLARK & CO., Shelton, Conn.

L. D. PHONE 1045. Our Own Foundry Insures Prompt Shipments. FOUNDED IN "45."

Soft, Smooth Castings and Finished Hardware Specialties to Order.

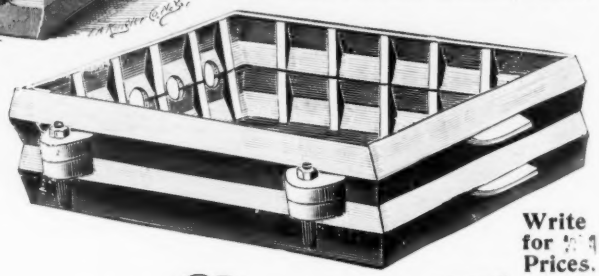
Hardwood Bench Rammers, 35c PER PAIR F. O. B. Newark.

OSCAR BARNETT'S OLD RELIABLE

Ribs in Flasks increase weight and obstruct ramming—two important features. Do you want them? You are the Doctor.

SAME PRICE AS <STANDARD> BEVEL.

DEMAREST PATENT RIBBED, 1855.



<STANDARD> BEVEL FLASK.

All Faces Level, Accurately Assembled, Guaranteed to Interchange Perfectly. Not Bored from Worn Flasks, but Hardened Steel Bushed Templets. Pins, Steel, 1-1000ths of an inch.

BRASS FOUNDRY SUPPLIES.

Write for Prices.

Oscar Barnett Foundry Co.,

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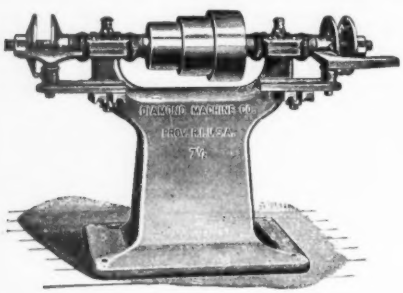
FARWELL'S MOLDING MACHINES Send for Catalogue

THE ADAMS COMPANY, DUBUQUE, IOWA

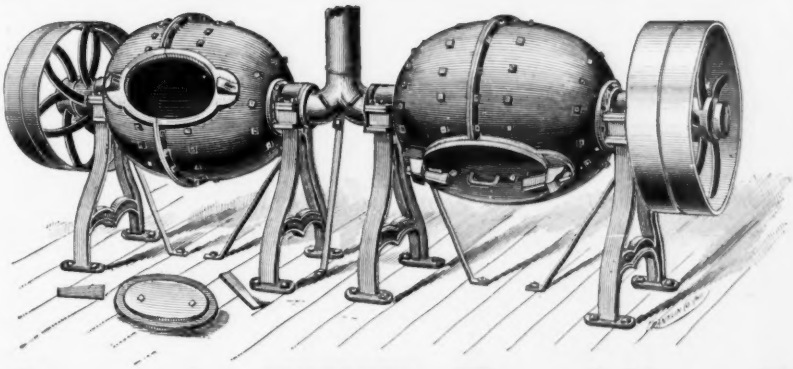


No. 7½ GRINDER.

This Grinder

was designed by us for foundry use. One stove maker has 16 of them. The distance between wheels is 48 inches, diameter of spindle between flanges 1¾ inches or 2 inches, as ordered. Babbitted boxes with three ring oilers. Weight, 1200 lbs. If you want a good substantial grinder write us for circulars and prices.

DIAMOND MACHINE CO. Providence, R. I.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT, ILL

Right off the Press

PENTON'S FOUNDRY LIST
FOR 1900

The most complete list of the Iron Foundries in the United States that has ever been published.

More than eight thousand letters were written to insure its correctness.

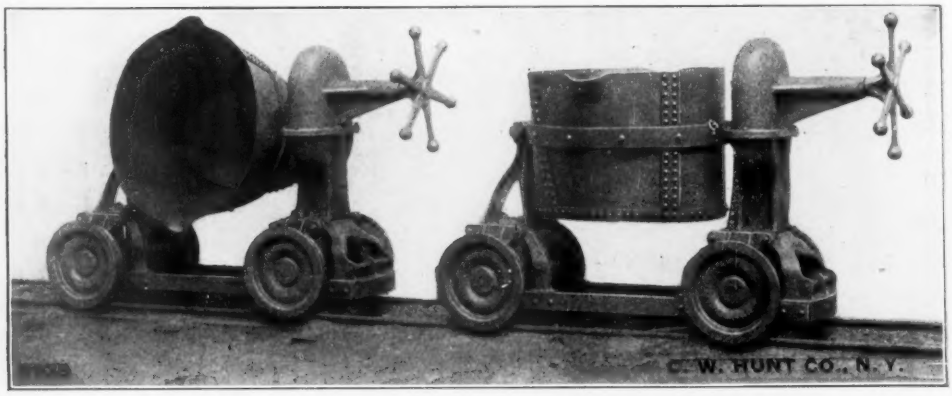
It gives the names and location of all foundries in operation and in course of erection up to date.

Penton's Foundry List is published in pocket size, contains 223 pages and is handsomely bound in leather.

It is the one book that will pay for itself many times over to those who need a reliable directory.

THE FOUNDRY PUBLISHING CO.,

PRICE, $10.00 POST PAID. DETROIT, MICH., U. S. A.



Ladle Cars, 1,500, 2,000, 3,000 Pounds Capacity.

Many foundrymen believe that these cars are not only more convenient to use in distributing molten metal, but are also safer than any overhead system of cranes or tackles. No accident has ever occurred in the use of these cars. The height of the top of the ladle above the rails, when upright, is 36 inches; for convenience in pouring into hand ladles, the shape of the body and the position of the trunnions are arranged so that the spout, when tipped, pours into a ladle 17 inches high. The gear for revolving the ladle, is our patent cam gear, that locks the ladle in every position, and possesses the remarkable feature of having both shafts revolve in the same direction. When the handles are moved, the ladle moves steadily in the same direction as the handles, but only one-twelfth as fast.

Our system of narrow-gauge tracks, switches, curves, turntables, etc., for use in manufacturing establishments and to accommodate such special cars as the above, is worthy of careful investigation by those who are apt to be interested. Catalogue No. 9904 contains useful data, besides thoroughly treating this subject. Copies will be mailed to those interested. Please address the works direct.

C. W. Hunt Company, Brad Street, WEST NEW BRIGHTON, NEW YORK CITY.

The Only Way

to clean light castings is to pickle them. And the only acid to use is our

Hydrofluoric Acid

which does not dissolve the iron, (like other acids do), but instead dissolves the sand, thus your castings are not pock marked like they are with the common kind of acids.

We will write you further on this subject as soon as you give us your address.

General Chemical Co., of Pennsylvania,
PITTSBURGH.

Our Fluor Spar

will not only give you cleaner iron, but also make your cupola work better. It is the genuine stuff.

ESTABLISHED 1878.

STOW MANUF'G CO.,
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INVENTORS OF THE

FLEXIBLE SHAFT
FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

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Mailed post-paid upon receipt of price.

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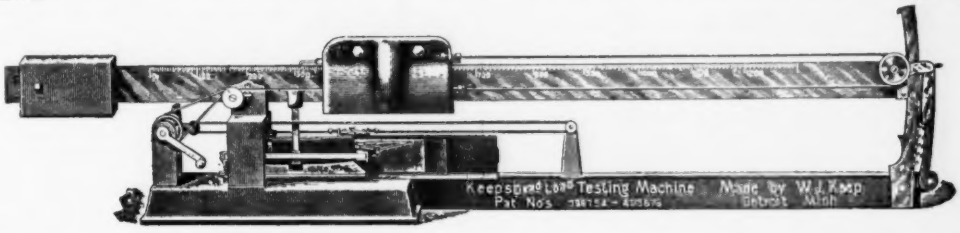

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OF A DESIRED QUALITY
AT A LOW PRICE. ✻

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KEEP'S TEST APPARATUS.

MOLDING MACHINES

Suited to Any Condition.

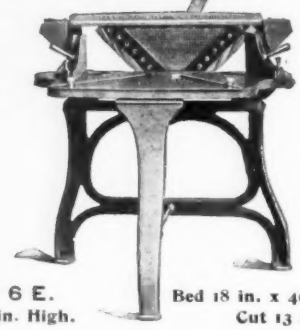
The cost of patterns often eclipses the cost of Molding Machines.

The sun of economy always shows our methods in strong light.

THE TABOR MFG. CO.
ELIZABETH, N. J.

FOX WOOD TRIMMERS

Ten .. Sizes.



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Cut 6 in. High.

Bed 18 in. x 40 in.
Cut 13 in. long.

Angular movement of Gauges **105 Degrees.** Gauges are accurately located at all prominent angles by **Our Patent Taper Stop Pins.**

BUY OF THE ORIGINAL MANUFACTURERS.

Look over the equipment of your Pattern Shop. It will pay you to see that **each workman** has **a small Fox Trimmer** and that there are enough of the larger sizes for the larger work. They save lots of time and turn out better work than otherwise obtainable.

12,000 SOLD. PRICE, $12.00 AND UP

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is used in making brass and bronze castings; it makes a superior metal, sounder castings, more homogeneous in structure, richer color, better wearing metal, of higher surface lustre than alloy made with imported tin. U. S. TIN is to be used in same proportions as imported tin.

The Price is Much Lower.

The difference in price, the superiority of metal, and sounder castings should induce all users of metals to make comparative tests. We will send to responsible parties small lots of the U. S. TIN on approval, and if satisfactory, will make contracts covering a given time. Shall be pleased to correspond with all who may be interested.

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HIGHEST IN PRICE.

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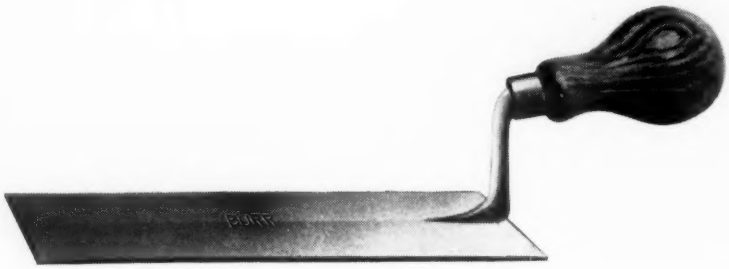
WE are the largest manufacturers of Molders' Tools in the world. Every first class Foundry Supply House and Hardware Store sells them.



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BURR'S DAMASCUS TOOL WORKS,

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Every man to his own business.

Ours is to make Chaplets. Having special machines for this purpose, we make the best Chaplets that can be made.

Making a business of making Chaplets, we can sell them to you cheaper than you could possibly make them. In that way you get the very best Chaplet at a very low price.

We are prepared to furnish all kinds of Chaplets. Write us for samples, stating what kind of castings they are to be used for.

The Fanner Manufacturing Co.,

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Stove Trimmings, Stove Scrapers, Stove Rods, Stove Bolts. Quality first-class and prompt shipment guaranteed. Catalogue and prices furnished on application.

A Queer Complaint.

The Purchasing Agent of a large Traction Company, under date of October 24, 1899, writes us as follows:

"There is only one fault we have to find with your wheels, and that is they 'last too long. Our Master Mechanic informs this office that in trueing up car 'wheels, Carborundum wheels last four or five times longer than Emery, and 'have proven all you claim for them."

CARBORUNDUM

wheels are made to last; and they not only last, but do their work faster and better than any others.

Carborundum sells at a higher price than emery, but for all grinding and polishing purposes it saves money for its users. This is guaranteed; 60 days allowed for trial. Our catalogue tells all about it.

THE CARBORUNDUM COMPANY,
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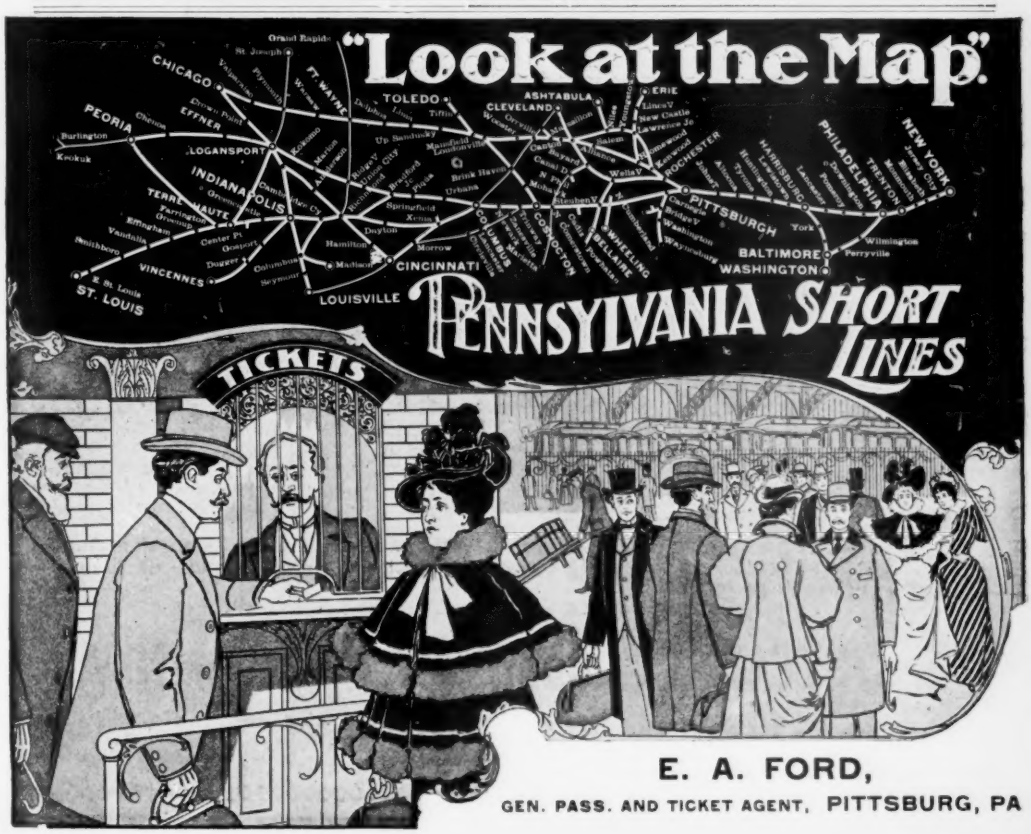

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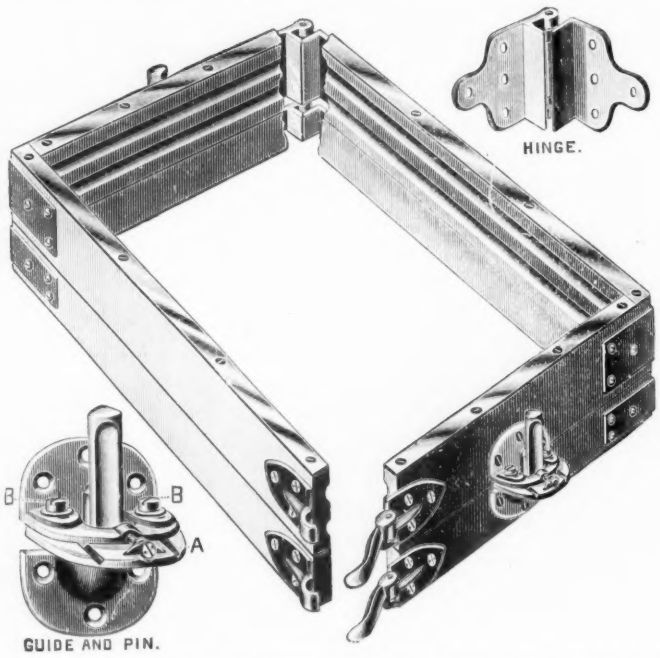
Stearns Improved Snap Flask

Cheaper than You Can Make Your Own.

The large "V" shaped pins with corresponding bearings insure a level lift of the cope, enabling comparatively inexperienced help to mold difficult patterns.

The inner edges of the malleable iron hinge are beveled, bringing the corners perfectly true. The flasks are made of whitewood—light in weight, yet stiff and strong, edges and corners bound with iron.



These sizes, which are inside measurement, with 2-inch nowel and 3-inch cope, are kept in stock:

No.	Sizes.	No.	Sizes.	No.	Sizes.	No.	Sizes.
1	9x13	8	10x13	15	11x13	22	12x13
2	9x14	9	10x14	16	11x14	23	12x14
3	9x15	10	10x15	17	11x15	24	12x15
4	9x16	11	10x16	18	11x16	25	12x16
5	9x17	12	10x17	19	11x17	26	12x17
6	9x18	13	10x18	20	11x18	27	12x18
7	9x19	14	10x19	21	11x19	28	12x19

PRICE, $2.50 Each. Special Sizes furnished at an advance of **25** cents, net, each. The metal furnishings, only, will be sold to parties desiring to make up their flasks. **Price, $1.50 per set.**

E. C. STEARNS & COMPANY, Syracuse, N. Y.

Makers of STEARNS BICYCLES and Manufacturers of Hardware.

Directory of Leading Dealers in and Manufacturers of Fire Brick

Established 1856.

HENRY MAURER & SON,

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FIRE BRICK of All Shapes and Sizes.

Cupola Linings, Etc.

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Works—Maurer, N. J.

FIRE BRICK for All Purposes.

Extra quality Fire Brick suitable for Iron Trade. Largest Stock in the State, all Shapes and Sizes.

Kiln Brick, Cupola and Furnace Blocks a Specialty.

Finest Quality Fire Mortar and Crude Clay. Shipments promptly anywhere. Send blue prints for our prices on Special Work.

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Established 1826.
Incorporated 1856.

PRESBREY STOVE LINING CO.

Manufacturers of

FIRE BRICK AND STOVE LININGS.

Office and Works, 212 Somerset Ave.,

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FIRE BRICK and MOLDING SAND.

All Grades and Shapes of Fire Brick and Cupola Block.

H. S. VROOMAN,

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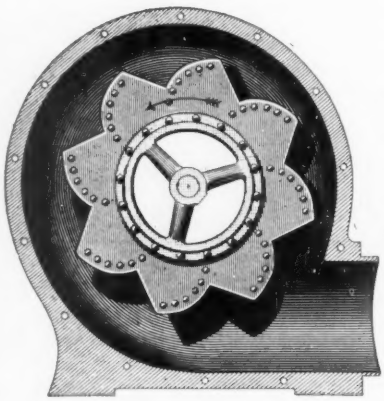
The Poole Blower



requires only 75 per cent. of the power expended by other blowers to produce the same result.

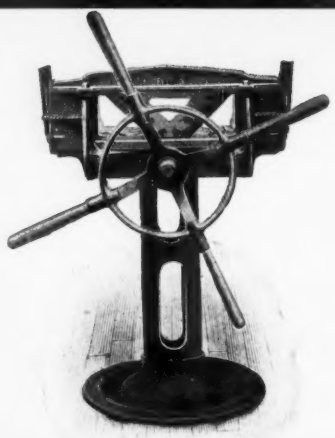
The bucket wheel of the ***Poole Blower*** is what makes it capable of doing its work with a less expenditure of power than fans having straight blades.

The construction of the ***Poole Blower*** enables it to deliver the power furnished it at the other end of the line. The air can not back out, as in other types.

We would like to talk these things over with you. We are satisfied we shall have no trouble in convincing you that the ***Poole Blower*** is the best medium for handling air up to a pressure of sixteen ounces. Do we get the chance?

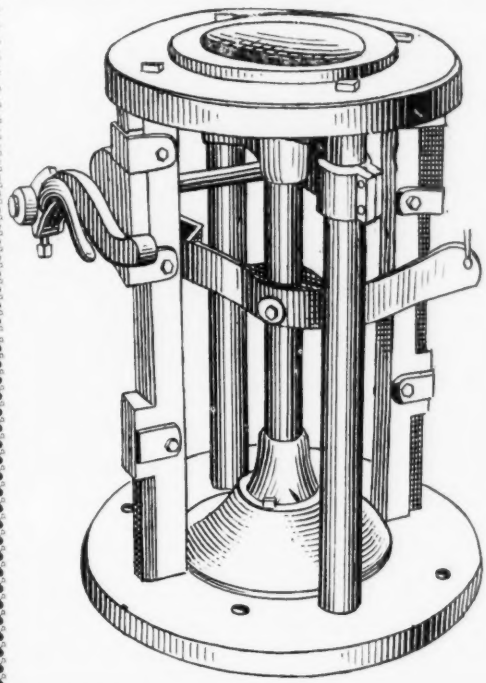
Manufactured and Sold by **J. B. & J. M. CORNELL,** 26th St. and 11th Ave. NEW YORK CITY.

OLIVER WOOD TRIMMERS SAVE PATTERN WORK.



THIS is our No. 5 Oliver Wood Trimmer. It is just one more of he large aggregation of pattern shop labor savers, which have made the name "Oliver" so justly celebrated. We cannot help you, if you do not let us. If you let us, we can. There are so many valuable points to reccommend these machines, that we cannot tell them all in this space. We can do better, talking to you personally anyway. Start the New Year right. Save money this month by spending it for an Oliver Wood Trimmer. Just send us your name and we will tell you all about them.

AMERICAN MACHINERY CO.
GRAND RAPIDS, MICH.



HERMANN

Molding Machine.

Hand Ramming Reduced 95 per cent.

This machine is especially valuable for deep work—and prevents swells in the castings.

SEND FOR PARTICULARS AND PRICES.

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A GOOD THING!

That's what you are missing when you fail to use **"DOME" FIRE CLAY.** One Steel Manufacturing Company has used *fifty carloads since January 1st, 1899;* another formerly used the highest grade of Pennsylvania Clay and is now using **"DOME" CLAY** *exclusively;* and so on.

Let us send you a *free sample for test,* and put you in the way of saving over 100 per cent. on your Clay bills, *sure.*

Our Cupola Blocks, Fire Brick, Molding Sand, Fire Sand, etc., are of the most substantial kind.

Our References—any Leading Manufacturer in the Northwest. *Write us!*

GARDEN CITY SAND CO.,

LONG DISTANCE PHONE, M 5102.

188 Madison Street, CHICAGO.

PIG IRON.

A Perfect Mixture is Possible

but many foundrymen have yielded to the temptation to use "any old thing" during the past year, on account of the scarcity of pig iron.

The extra time and attention necessary to make satisfactory mixtures from job lots has demonstrated that

It Costs But Little More

to buy a regular supply of first-class standard brands from agents handling all varieties of pig iron and coke. It pays to tie up to those who have had many years experience, whose reputation for fair dealing is unquestioned, who have iron at all times and from whom

You Can Get It

when needed.

Careful attention is given to each contract, whether it is for a single carload or ten thousand tons. Since Jan. 1st, 1899, orders have been received

From

nearly all parts of the civilized world and have amounted to about 50 per cent. more than during 1898.

Don't forget us when you want Pig Iron or Coke.

Rogers, Brown & Co.,

Cincinnati.	**New York.**	**Chicago.**	**Buffalo.**	**Philadelphia.**
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Pure East India Plumbago . . . .

SILVER LEAD, GRAPHITE.

Guaranteed to be Absolutely Pure and Unadulterated.

Let us send you a Sample Barrel, and if not as represented return to us at our expense.

. . . . THE . . . .

S. Obermayer Co.

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Write for General Catalogue No. 26.

Seal Coal Facing.

Bituminous Facing.

CAR LOADS OR LESS—IN BAGS OR BBLS.

Guaranteed to be ground fine and uniform, go further in use and produce better results than any others.

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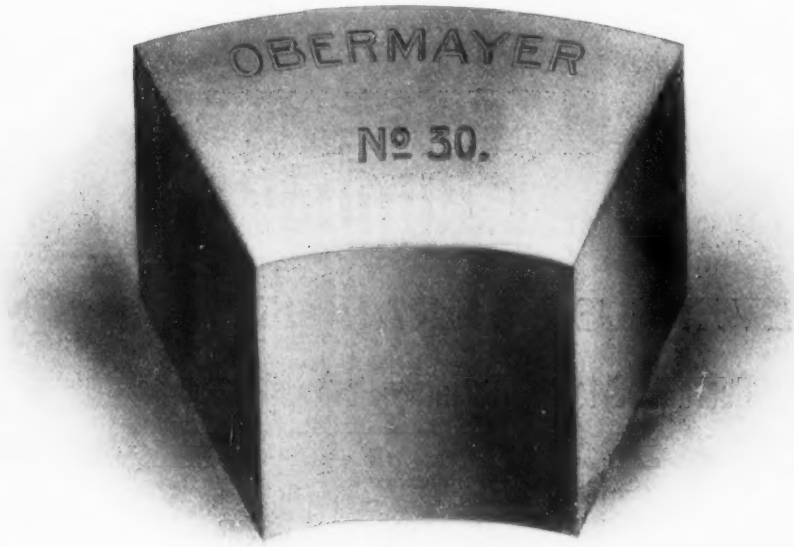


IF YOU ARE OPEN TO CONVICTION

the following reasons should be sufficient to convince the most skeptical of the superiority of our

OBERMAYER CUPOLA BLOCKS.

1.—Fire attacks a perpendicular joint much faster than a horizontal one. That's why we make our block only 6 inches high, covering the same surface covered by any other block, by making our Block 12 inches long.
2.—Fewer joints are had with our lining—it takes a less quantity of blocks to the circle.
3.—We have sizes to fit any diameter, and no skill is required in laying them.
4.—We make our blocks of the very best fire clay we can secure.
5.—For Cupola Lining we advocate a 6 inch wall as superior to one 4½ inches thick. In fact it is economy to the purchaser.
6.—We guarantee every lining we sell, and if not entirely satisfactory, agree to replace same F. O. B. cars your city free of charge.
7.—To save on freight, we offer you deliveries from either our plant at Oak Hill, Ohio, or from warehouses in Cincinnati or Chicago.

If these reasons are not sufficient write us for more. Our Fire Brick manager takes pleasure in answering questions.

THE S. OBERMAYER CO.,

CINCINNATI. WORKS: OAK HILL, O. CHICAGO.

WE MAKE ANYTHING WANTED IN FIRE BRICK.

Crucibles

CRUCIBLES for Brass Melting.
CRUCIBLES for Steel Melting.
CRUCIBLES made specially for the different Metals.

CRUCIBLES for Oil Fires.
CRUCIBLES for Coal Fires.
CRUCIBLES for Coke Fires.
CRUCIBLES for Gas Fires.

We recognize the fact that different metals and different fires demand different crucible mixtures for the best results and we are prepared in every way to meet that demand.

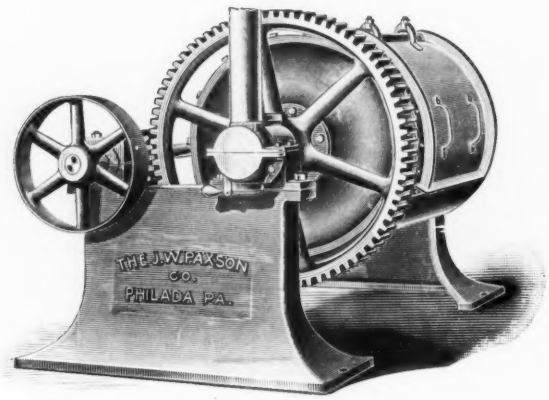
Although we are the oldest crucible manufacturers in the world, we are up-to-date in every particular, and the knowledge of our chemists and our skilled workmen is at the service of our customers. If you are not quite satisfied with your crucibles or their work, possibly we can help you. We shall be glad to answer any inquiries.

Joseph Dixon Crucible Co.

JERSEY CITY, N. J.

Paxson Exhaust Rumblers

MADE OF STEEL.



MADE IN SIZES:

18	inch	diameter,	any	length	from	24	inch	to 48	inch.
24	"	"	"	"		30	"	48	"
30	"	"	"	"		36	"	54	"
36	"	"	"	"		36	"	54	"
40	"	"	"	"		36	"	60	"

No Cast Iron Staves

BUT

One Solid Sheet of Steel.

Wide Door Extends Full Length of Mill.
Ribs on Inside to Keep Castings from Slipping.

We have lately installed a large gang of them in the works of the General Electric Company, Schenectady, N. Y., where they are run by electric motors.

These are the best and most economical Rumblers ever made.

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

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Paxson-Colliau Cupola

The more you examine it, the better you will like it . . . . . .

The Acme of Science in Cupola Construction . .

All that was Best in the old Colliau Cupola, with Every Improvement suggested by long experience added.

LOCATION AND AREA OF TUYERES INSURE THE HIGHEST MELTING . . . EFFICIENCY. . . . . .

It keeps us hustling to fill the orders for these goods.

MADE ONLY BY THE

J.W. Paxson Co.

1021 . . .
North Delaware Avenue,

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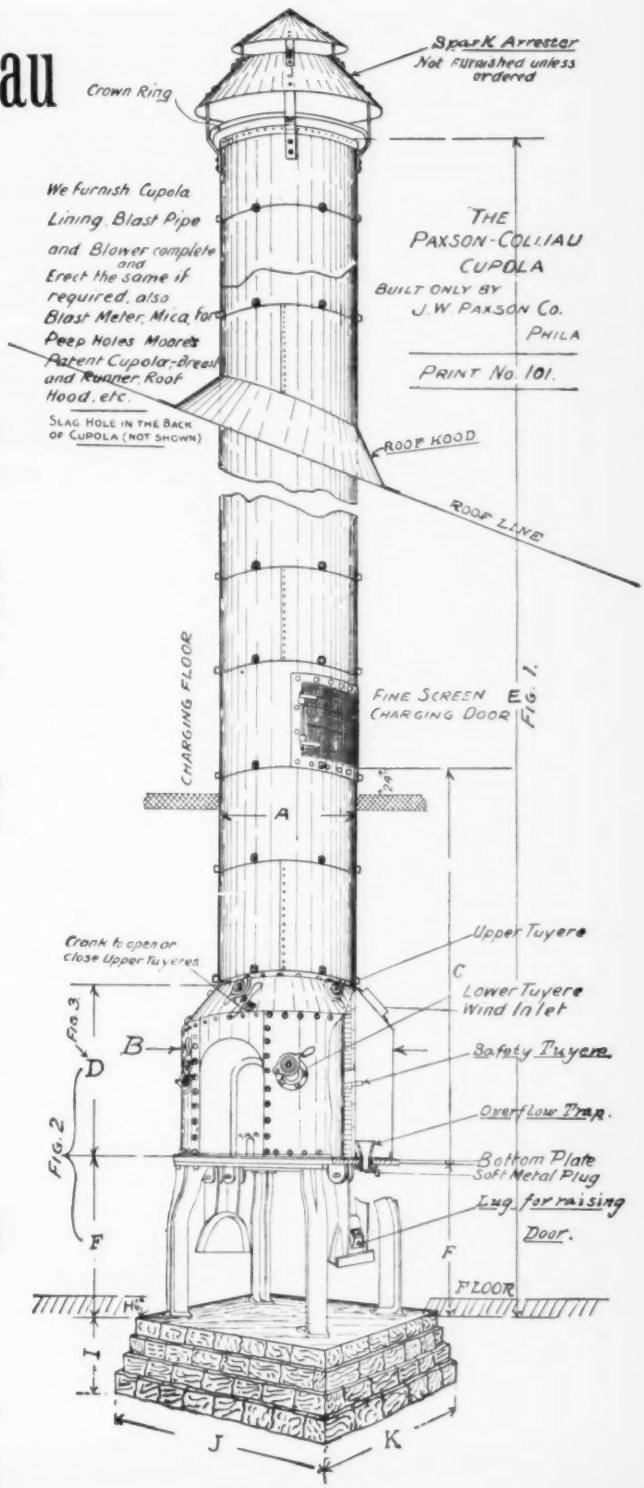
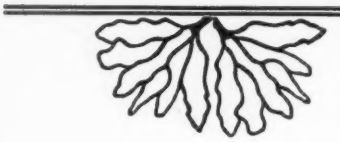


Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

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WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

HEAVY WORK IN GREEN SAND

becomes easy of accomplishment with the aid of the **C. F. M. Founders' Perfect Wash.** You know some foundrymen have to fuss around and make the least job that comes along in dry sand, or their castings will look like thirty cents. Lots of foundrymen, when they look at a green sand casting made with the **C. F. M. Perfect Wash** believe it has been made in dry sand. That shows the **Perfect Wash** is **doing** its work. A casting made with it has a trade mark that is all its own. Won't you give us a chance to prove this.

The Cleveland Facing Mill Co.,

FRANK H. CHAMBERLIN, Proprietor. CLEVELAND, OHIO.

THE PERFECTION CORE BOX is always ready for use in all lengths and diameters.

M. M. COCHRAN, PRES.
J. R. LAUGHREY, VICE-PRES.

JNO. H. WURTZ, SECY.-TREAS.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. **5000 Tons Daily Capacity.**

300 30-TON COAL CARS — 50 30-TON COKE CARS.

Foundry Coke Our Specialty.

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

DIRECTORY OF LEADING PIG IRON DEALERS.

HUGH W. ADAMS & CO.,

PIG IRON MERCHANTS,

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MATTHEW ADDY & CO.

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Agencies,

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DAYTON COAL & IRON CO.

(Limited)

PIG IRON,

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DECAMP BROS. & YULE,

Pig Iron and Coke.

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MALLEABLE BESSEMER PIG IRON.

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PIG IRON, STEEL, COKE, ETC.

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COAL, IRON ORE

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Cleveland, Ohio.

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Foundry, Forge, Charcoal and Bessemer

PIG IRON,

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PIG IRON and COKE.

Foundry Mixtures a Specialty.

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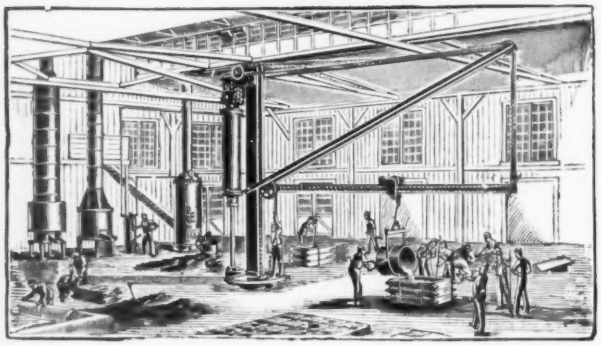
PITTSBURG, CLEVELAND.

STEVENSON, FIELD & CO.

PIG IRON and COKE,

Columbus, O. St. Louis, Mo

You Find Ridgway Footprints

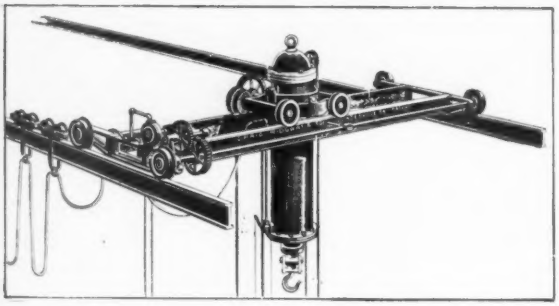


5-Ton Steam Hydraulic Crane in a Foundry.

In nearly all the first-class plants in this country (of late in Europe somewhat, also), in the shape of our wonderful Steam Hydraulic Balanced Cranes. Hundreds of men who are reading this card, in this, the last year of the Nineteenth Century, read it with a kind of sense of partnership in it, for they all have Ridgway Cranes busy at work out in the shops and they can fully appreciate all we say about it month after month. These men show how they consider the Ridgway Crane by the fact they get more of them whenever they need additional cranes. In almost every mail is some man or other crying for more. A short time ago we printed four well known concerns which just happened to be by us when we sat down to write our monthly card, and who were all yelling for more Ridgway Cranes.

Why do people who have Ridgway Cranes always want more? Why do people who get Ridgway Cranes grow so enthusiastic over them? They buy other machines and don't make much fuss about the performance of them. But when a man puts in a Ridgway Crane he takes all his friends out to see it. He also sets Ridgway himself, whom he has never seen, down among the list of his friends. Why is this? Can you take a hint? Never was such a money-maker as the Ridgway Crane.

HYDRAULIC AIR HOISTS



No, siree, this Oil Governed Air Hoist is not as cheap as we can furnish you plain air hoists. It costs about three times as much to build. But when you get a Ridgway Hoist you have something for your money, and if it don't save its cost in a few weeks you don't have to keep it. The fact that we are furnishing these excellent hoists to the best shops should influence you a little.

"PLEASE TAKE THE ELEVATOR."

About all the rest of the United States

Query: Shall we say United States *is* or *are*?

CRAIG RIDGWAY & SON CO., COATESVILLE, PA.

EUROPEAN AGENT,

CHAS. G. ECKSTEIN, 16 Spandauerstr., Berlin, Germany.

William Sellers & Co. Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY

SAND MIXER.

Not an Experiment

PRACTICAL.
ECONOMICAL.
EXPEDITIOUS.

NOTE.--In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing molding sand, facing sand,** and **core sand**, we have issued a small pamphlet which will be sent on application.

Among late Purchasers are :

American Radiator Co., Buffalo, N. Y.
American Radiator Co., Titusville. Pa.
National Malleable Castings Co., Indianapolis, Ind.
National Malleable Castings Co., Cleveland, Ohio.
Fischer Foundry & Machine Co., Pittsburg, Pa
R. Hoe & Co., New York.
U. S. Arsenal, Rock Island, Ill.
Michigan Malleable Iron Co., Detroit, Mich.
New York Air Brake Co., Watertown, N. Y.
Norfolk & Western R. R., Roanoke, Va.

And YOU would find as they have found, that it is one of the most valuable machines you can put in your Foundry.

Correspondence Is Solicited.

Over 15,000 in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries,

In addition to 400 Railroads and over 500 Contractors.

REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.,

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

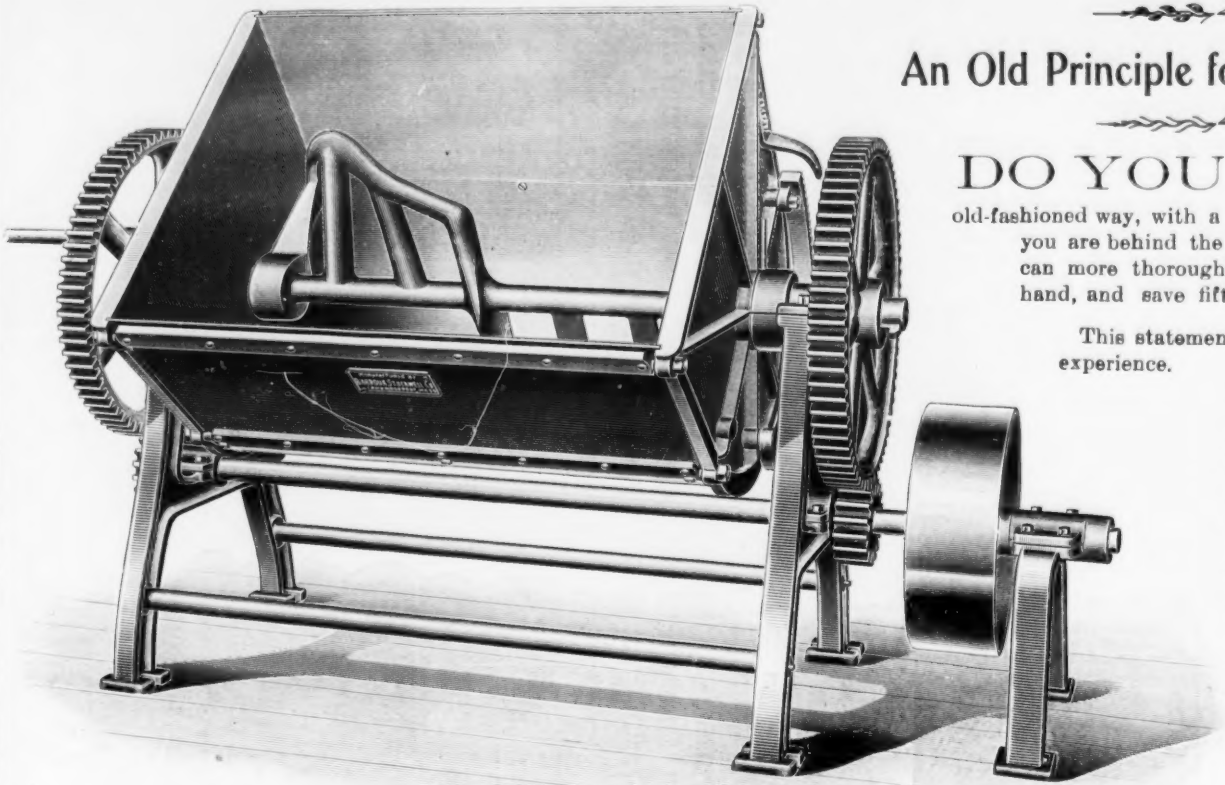
ROSS-MEEHAN FOUNDRY CO.
CHATTANOOGA, TENN., May 5, 1896.

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is contrary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y. & Treas.

BOSTON FOUNDRY MIXER.



An Old Principle for a New Purpose.

DO YOU mix your facing sand, core sand, fire clay, etc., in the old-fashioned way, with a laborer and a shovel? Then you are behind the times. With this mixer, you can more thoroughly mix it than is possible by hand, and save fifty per cent. of your labor.

This statement can be verified by actual experience.

The material is shovelled into the machine or fed in through a hopper, after riddling. The machine is then started, and in five minutes the mass is perfectly mixed. Turning a crank at the side cants the machine and empties the material either on the floor or into a receptacle provided.

Capacity, 250 lbs. every five minutes.

Pulley, 24 in. diam. x 6 in. face.

Floor Space, 7 ft. x 3 ft.

Speed of Pulley Shaft, 125 revolutions.

Weight, 1250 lbs.

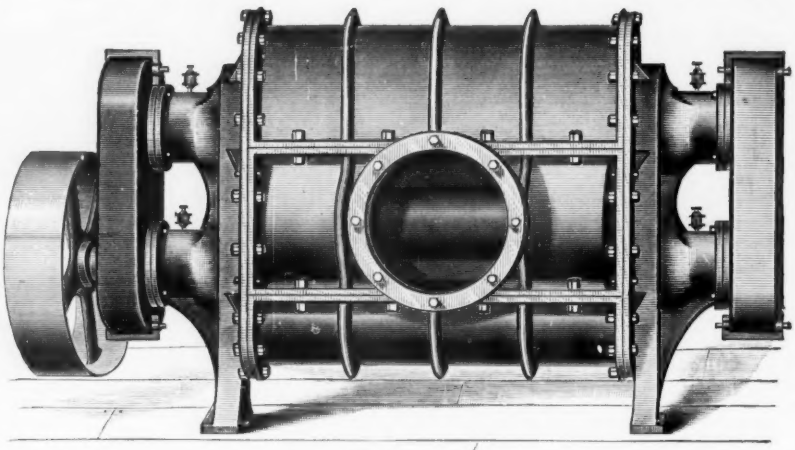
For further particulars, write

BARBOUR-STOCKWELL CO., 205 BROADWAY, CAMBRIDGEPORT, Mass.

44-46 Washington Street, NEW YORK.

P. A. Beaver, Jr., Sec'y, & Treas.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: Frazer & Chalmers, Inc. CHICAGO, ILL., and BRANCH HOUSES.

All the Troubles

the foundryman has in satisfying his customers are caused by changes in the character of the materials he uses.

Take for instance a car-load of pig iron. It may be all right and it may not. When the castings come out hard one will say the iron is too high in sulphur, another that it is too low in silicon, a third may advance the opinion that the iron is all right and that the coke is to blame.

There is only one way of settling all these questions. That way is to have your materials analyzed. It is the only way in which the **real facts** can be learned. It is the only way that has no guess work about it.

When you get in trouble and don't know which is which, come to us. We have the best of apparatus for analyzing all kinds of materials and we will put your shop straight at reasonable rates.

* * * * * *

Are you acquainted with **Smooth-On,** the scrap saver ? If not, get a small can, try it and you will never be without it. When it comes to repairing a casting **Smooth-On** is many times worth its weight in gold.

Do not compare **Smooth-On** with the so-called iron fillers. Putty is a filler and a very poor one. It only stops a leak as long as you keep your finger on it. The minute you turn your back it is out and damaging your reputation. Those mixtures known as " Fillers " do the same thing.

Smooth-On is a chemical compound that upon application to a leaky casting or a sandhole or blowhole in same, becomes in color and everything else part of the casting itself. The part that is repaired with **Smooth-On** can be finished like any other part of the casting, and no amount of rough usage will dislodge it.

Bear these things in mind if you have been buncoed with iron " Fillers."

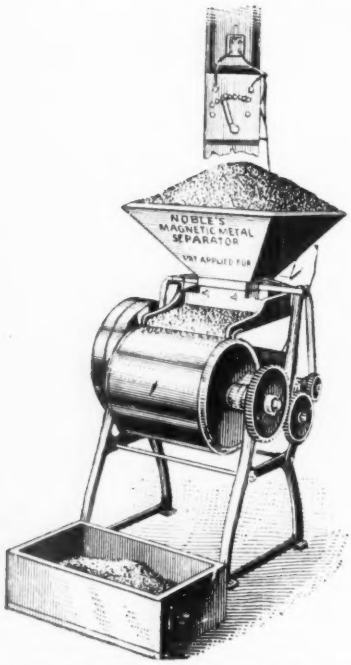
SMOOTH-ON MFG COMPANY,

VREELAND TOMPKINS, CHEMIST AND MANAGER.

547-549 COMMUNIPAW AVENUE. JERSEY CITY, N. J., U. S. A.

Some of our

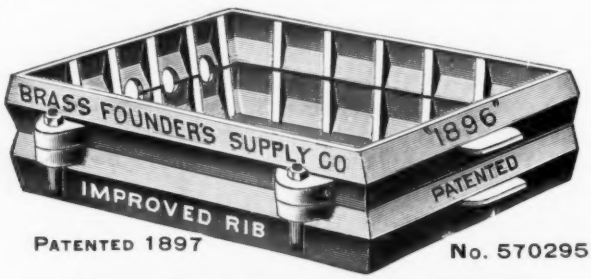
Specialties



Our Magnetic Seperator will save enough metal in a few weeks to pay for itself.

Our Gate Cutter will separate the casting from the gate without bending the castings.

Do not let others sell you an inferior Flask. We make the only improved ribbed Flask. Note date and number of patent.



NO OTHERS HAVE THEM.

Send for our Catalogue of money makers.

BRASS FOUNDERS SUPPLY CO.,

NEWARK, N. J.

ROOTS' BLOWERS

There are Brier ROOTS
Cube ROOTS
Square ROOTS

BUT ONLY ONE

P. H. & F. M. ROOTS

ALWAYS THE STANDARD.
OTHERS IMITATE, BUT NEVER EQUAL.

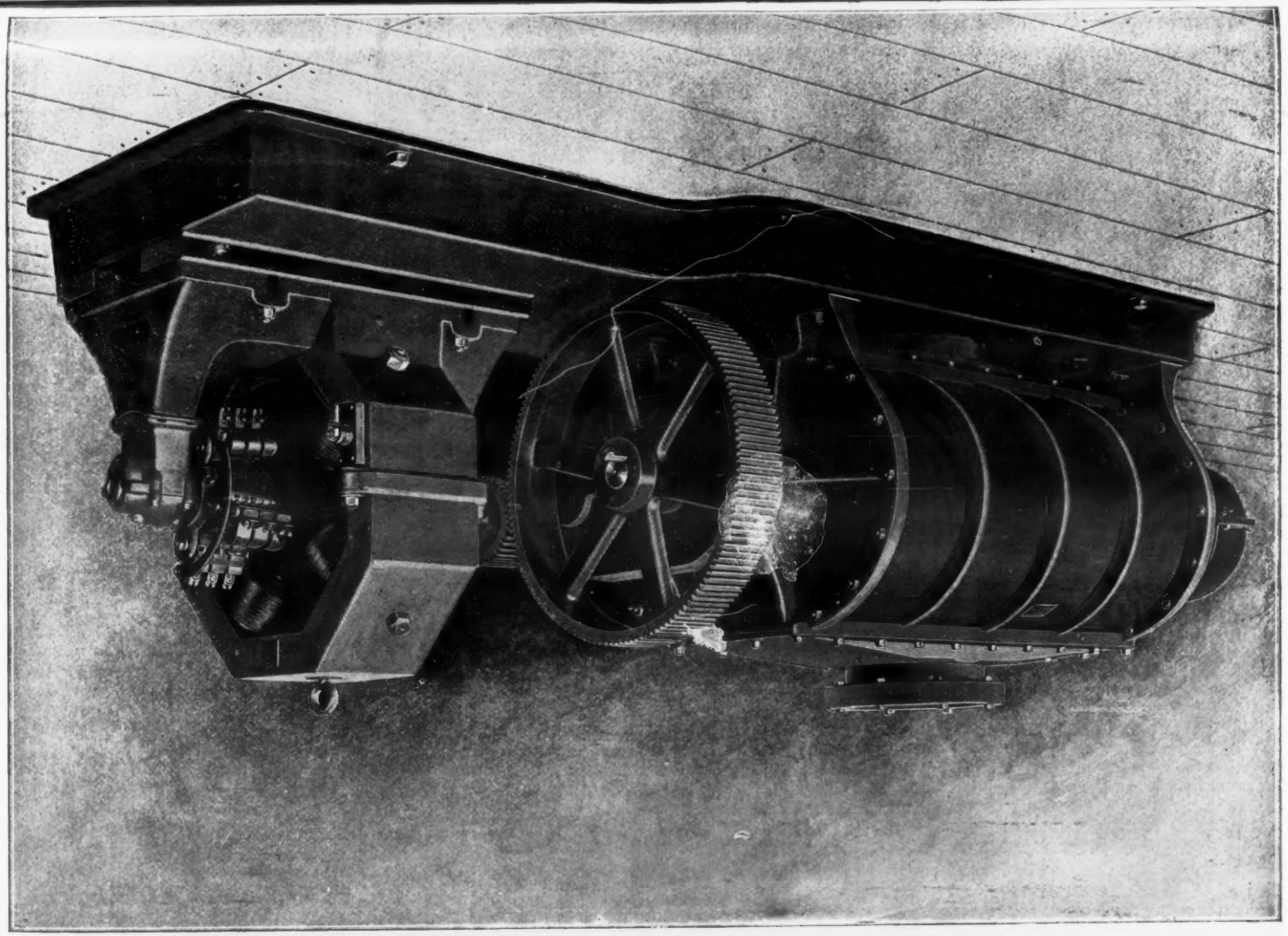
Forty years' experience boiled down to the most modern *Pressure Blower* in design and workmanship.

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot

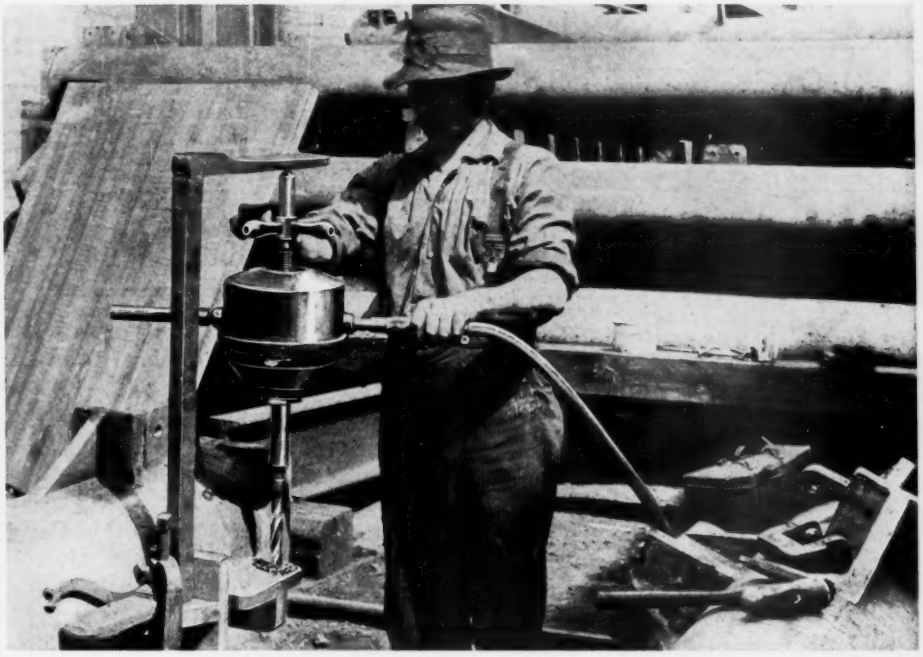
P. H. & F. M. ROOTS CO.,
109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

C. H. BRADLEY, JR. & CO.,
Vandergrift Building,
PITTSBURG, PA.

EDMUND A. FORDYCE,
156 Lake Street,
CHICAGO, ILL.



Taking the Machine to the Work



ECONOMIZES BOTH ROOM AND TIME.

BOYER PISTON AIR DRILLS

give the highest output in work with least air consumption and they will drill, ream, tap and screw in stay bolts with the smallest amount of labor.

BOYER PNEUMATIC TOOLS

are the best that skilled workmanship and carefully selected material can produce.

SEND FOR CATALOG OF COMPLETE LINE.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.

for a short argument

on the subject of "BRASS FURNACES."

That old pile of scrap you now have is neither working well nor economically. You may call it a brass furnace, because you can melt brass in it, but there is a difference between doing a thing and doing it right.

Every little while, you know that something gets out of kilter. The iron work warps and lets air in at places where it hinders melting. The brick work tumbles down and makes you lose time in putting it up again.

Honest, now, are you perfectly satisfied with your brass furnace, the work it does, and what it costs you to keep it up?

If so you are one of the very few. If not we will tell you the points of superiority in the ***Millett Brass Furnace.***

The iron work about the Millett furnace is of a design and put together in such a manner, that it will retain its shape.

We supply iron where this material should be used. There are no brick piers to obstruct the draft and tumble down every other day in the Millett furnace.

The grate area is right in the Millett furnace, so is the draft. In short there is no guesswork about any part of its construction.

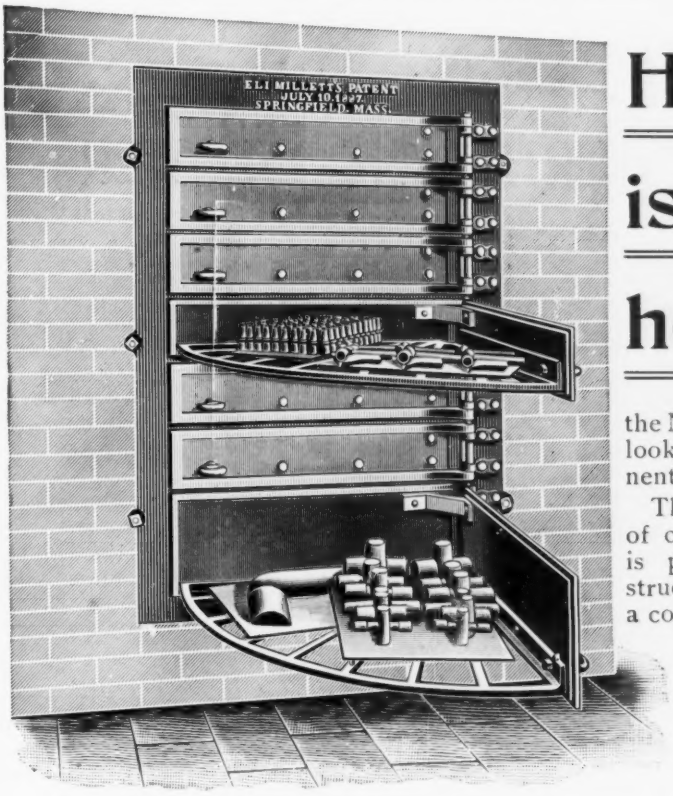
When you put in a Millett furnace you can depend upon a definite out put every day in the year. There will be no reason for excuses from any one.

Write us how much brass you want to melt per day and the size of crucibles you employ and we will furnish you an estimate of a model equipment.

Millett Core Oven Co.,

Brightwood, Mass., U. S. A.

Sole manufacturers of the Millett Core Oven and Millett Brass Furnace.



Here is how

the Millett Core Oven looks when permanently installed.

This offers a form of construction that is practically indestructible. It makes a core oven that will last more than a lifetime.

Aside from the lasting qualities of the Millett Core Oven is its point of economy. The double shelf arrangement enables you to get out a core whenever you want to without interfering in the least with the drying of other cores. The Millett Core Oven is the only one possessing this feature. We hold a patent on this. That is the reason others do not use it.

Then again, the Millett Core Oven is efficient. No other core oven does dry cores as perfectly. When you put your cores in a Millett Oven, you are sure that they will come out **right.** They will neither be half-baked nor burned.

The Millett Core Oven is one of the pieces of furniture no foundry ought to be without. There is money saved in putting it in.

Write us for partial list of users. The Obermayer Co., have our ovens on exhibition in Chicago and Cincinnati, as has also The Paxson Co., in Philadelphia. May be you will make a trip to one of these places some day. Take a few minutes to look up the Millett Core Oven.

Millett Core Oven Co.,

Brightwood, Mass.

REASONS WHY
THE STURTEVANT BLOWER
EXCELS THE ROTARY BLOWER

ADVANTAGE.	AUTHORITY.
More efficient	Howe, Snell
Less liable to get into an inefficient condition	Howe
Far less expensive	Howe, Mattes
Requires less skill and intelligence to keep up to highest efficiency	Howe
Sufficient pressure for any cupola is readily maintained	Howe
Power decreases with decrease of outlet area	Howe
Pressure increases with decrease of outlet area up to capacity area	Howe
Pressure of 20 ounces easily maintained	Howe
Less expenses for repairs	Snell, Mattes
Not susceptible to leakage	Snell
Always capable of producing same pressure	Snell
Less weight	Maker's Catalogues
More convenient to handle	Mattes
Volume automatically increases when cupola is put on or pipes leak	Mattes
Better adapted to variation in volume of blast	Schumann
Air delivered is proportional to requirements	Schumann
Requires practically no power when blast is off	Schumann
Largest number in use in United States	West
Blast is suitable for centre-blast cupola	West
No pulsation in the blast	Roots' Catalogue

The above is from the new Sturtevant Blower Catalogue No. 99. No statement is made without authority to back it.

FACTS CARRY MORE WEIGHT THAN OPINIONS.

Send for Catalogue No. 99 giving detailed information.

B. F. STURTEVANT CO.,

BOSTON, MASS.

New York. Philadelphia. Chicago. London.

57

It is easier

to roll a thing along than it is to carry it. Everywhere we see the cost of distribution lowered by rolling things instead of carrying them.

A few foundries are yet transporting all of their material through the expensive medium of a laborer and a wheel-barrow. What can't be handled this way is carried by more laborers.

Human power is the most high-priced power in the world. The man who would succeed should remember this.

Where you are now using this power in your foundry we would like to put in a trolley track for you.

When you come to the shop in the morning it will carry your castings to the cleaning room, it will bring in flasks, patterns, sand, etc.

Throughout the day whenever anything is wanted, you can get it via the trolley track route. One laborer and a trolley track is as good as ten laborers and a push car.

And the beauty of it is that the trolley track is in nobody's way.

Then again you can hang one of those handy air hoists on your trolley track and your molders do more work with less straining.

At night, when casting begins, you hitch on your ladle, give the molders their metal right on their own floor.

You simply can't appreciate what a trolley track will do 'til you have one in use.

There is only one trolley track, the **Coburn.**

Coburn Trolley Track Manufacturing Co.,

HOLYOKE, MASS.

Send us a rough plan of your shop with dimensions, and we will tell you what others have done and what we can do for you.

Soft Iron is Scarce.

This is what the papers say. This is what a good many foundrymen are saying after trying to get what they wanted.

We have made a specialty of making soft foundry iron.

We have been doing so for twenty-five years. We have kept ahead of the procession in the adoption of up-to-date methods.

We have paid special attention to the quality of our ore and fuel, resulting in a product that is as near uniform as it is possible to make it.

This iron, on which we have spent so much care is the

Cherry Valley Foundry Iron.

It has been the standard for a quarter of a century. It is likely to remain so.

We have some of this iron ready for immediate shipment. How much do you want ?

If your mixture does not produce satisfactory castings, write us.

Cherry Valley Iron Works,

Leetonia, Ohio.

"LITTLE GIANT"

Pneumatic Hammers

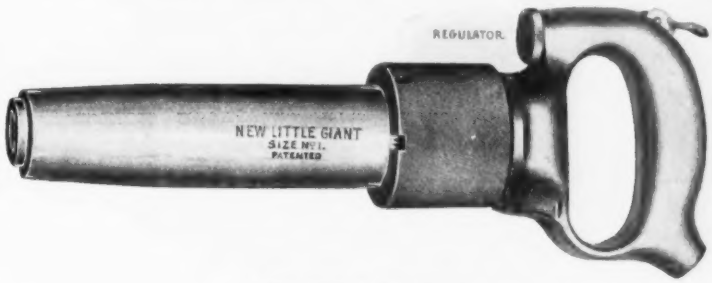
ARE ESPECIALLY DESIGNED FOR CHIPPING CASTINGS.

LIGHT. SIMPLE IN CONSTRUCTION.

DURABLE. EFFICIENT.

They have an air regulator which can be so adjusted as to admit a minimum amount of air and yet deliver a blow with full force of hammer under various pressures.

MADE IN ALL SIZES. Used in Foundries throughout the World.



SENT ON TRIAL. Guaranteed Against Repair for One Year.

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Standard Pneumatic Tool Co.,

Manufacturers Piston Air Drills, Boring Machines, Reversible Motor Chain Hoists, and all kinds of Pneumatic Tools and Appliances.

Main Office and Works, CHICAGO, U. S. A.

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HOLMES, STRACHAN & CO.,

Manufacturers and Shippers of

Works: Clarion Co. Pa. Jackson Co. Ohio.

FIRE BRICK

Brands: Steel Savage Mountain Holmes.

Best for Malleable Furnace and Cupola Work.

DETROIT, - - - MICH.

FIRE BRICK for All Purposes.

Extra quality Fire Brick suitable for Iron Trade. Largest Stock in the State, all Shapes and Sizes.

Kiln Brick, Cupola and Furnace Blocks a Specialty.

Finest Quality Fire Mortar and Crude Clay. Shipments promptly anywhere. Send blue prints for our prices on Special Work.

STATEN ISLAND CLAY CO.,

WOODBRIDGE, N. J.

Established 1856.

HENRY MAURER & SON,

Manufacturers of

FIRE BRICK of All Shapes and Sizes.

Cupola Linings, Etc.

420 E. 23rd Street, NEW YORK

Works—Maurer, N. J.

Telephone, Canal 267.

FIRE BRICK and MOLDING SAND.

All Grades and Shapes of Fire Brick and Cupola Block.

H. S. VROOMAN,

220 West Twentieth Street,

CHICAGO.

Established 1826.
Incorporated 1866.

PRESBREY STOVE LINING CO.

Manufacturers of

FIRE BRICK AND STOVE LININGS.

Office and Works, 212 Somerset Ave.,

TAUNTON, MASS.

If Quality

IS DESIRED, USE

Our

Crucibles.

McCULLOUGH-DALZELL COMPANY

PITTSBURG, PA.

WRITE FOR CATALOGUE.

Whiting Foundry Equipment Co.

GENERAL OFFICE AND WORKS; HARVEY, ILL., U.S.A. (CHICAGO SUBURB.)

CHICAGO OFFICE: 1543 MARQUETTE BUILDING.

CUPOLAS
TUMBLERS
LADLES
SIFTERS

AIR HOISTS
RECEIVERS
TURNTABLES
TRUCKS, ETC.

Engineers and Designers of Complete Plants for the Manufacture of

CAST IRON CHILLED CAR WHEELS

(WHITING PATENT SYSTEM.)

CAST IRON PIPE

(GAS and WATER.)

MALLEABLE AND STEEL CASTINGS

OUR SPECIALTY—

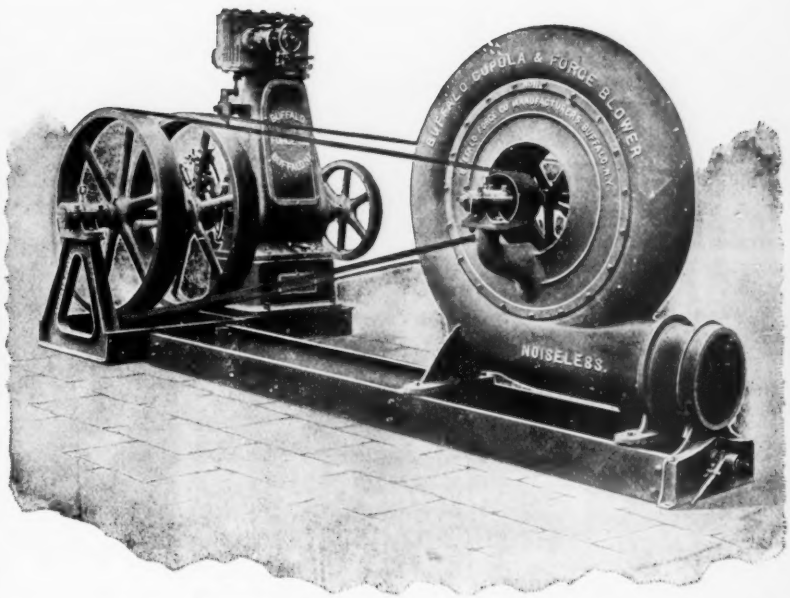
ALL TYPES OF CRANES.

Electric, Compressed Air and Hand Power.

EXPORT BUSINESS SOLICITED. SEND FOR CATALOGS.

BUFFALO CUPOLA BLOWERS.

BUFFALO TUMBLING BARREL EXHAUSTERS.



Buffalo Steel Pressure Blower on Adjustable Bed, with Combined Engine and Countershaft.

Buffalo Forge Company,

BUFFALO, N. Y., U. S. A.

The Buffalo Fan System of Heating and Ventilating Foundries, Machine Shops, and all Large Buildings.

The Buffalo Forge Company Engine for Select Service. Highest Award and Gold Medal, Omaha, 1898.

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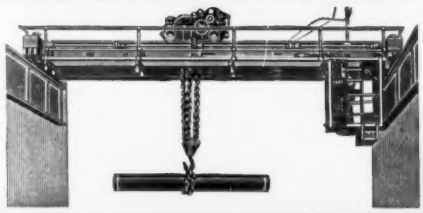

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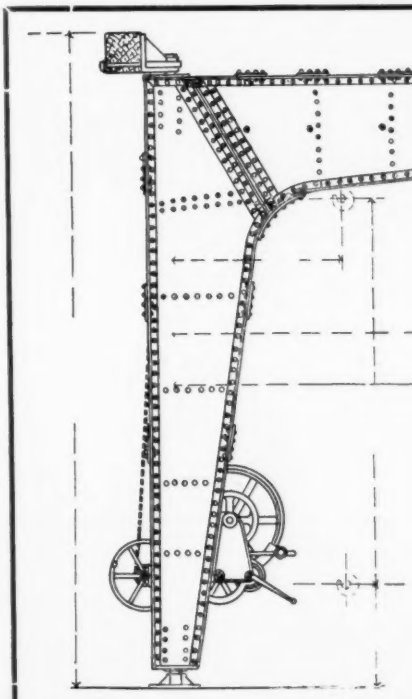

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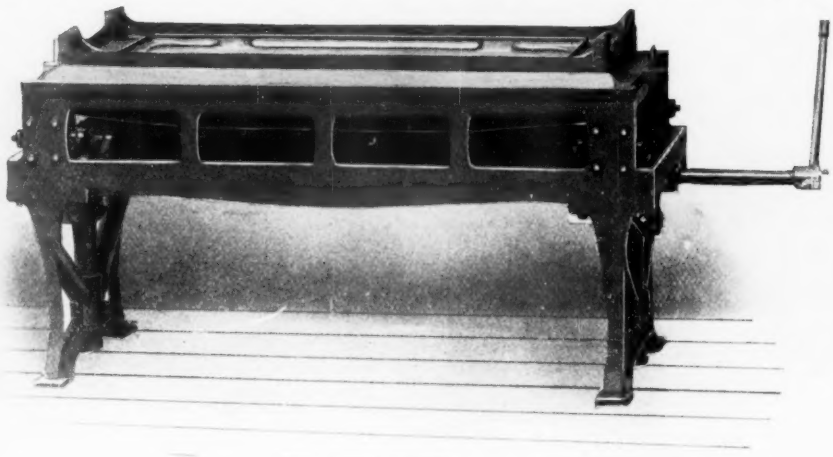

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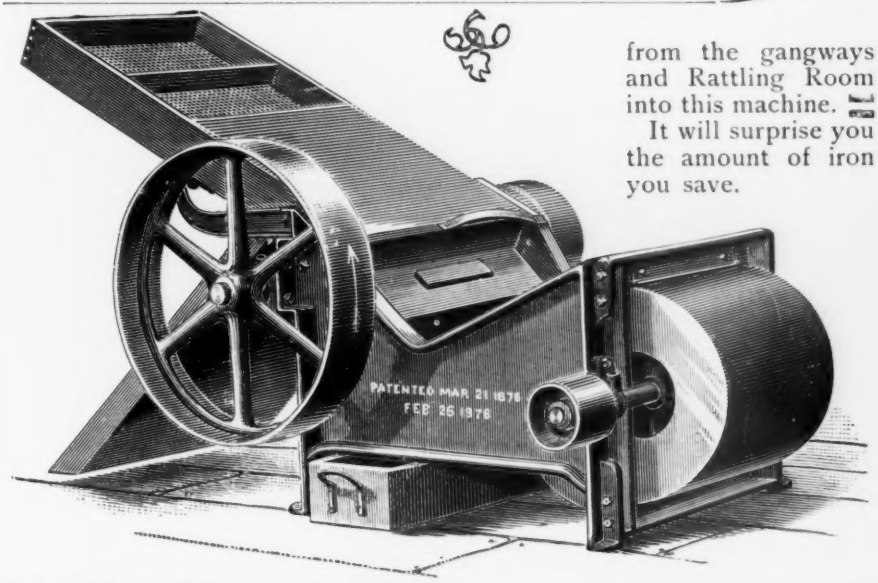

from the gangways and Rattling Room into this machine.

It will surprise you the amount of iron you save.

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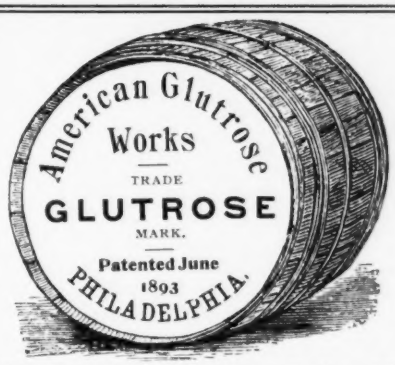

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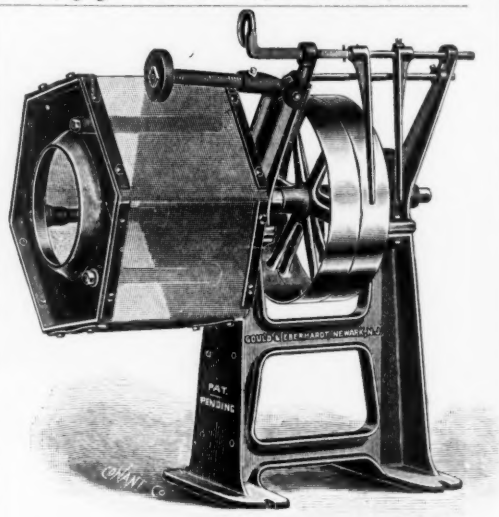

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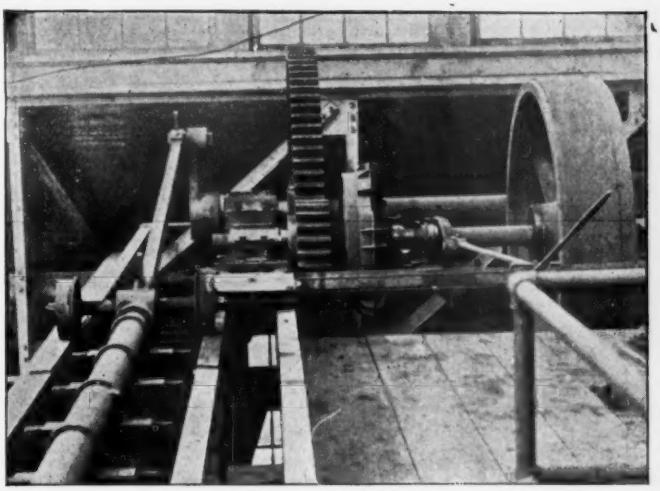

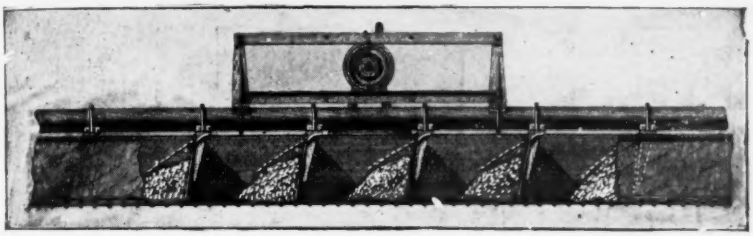

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Upon application, it becomes as hard as the casting itself, retaining the same color and general appearance. Send us your address and we will forward price list and a sample.

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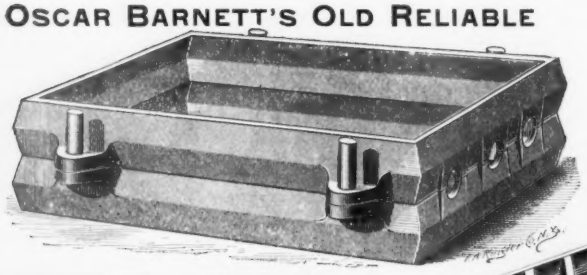

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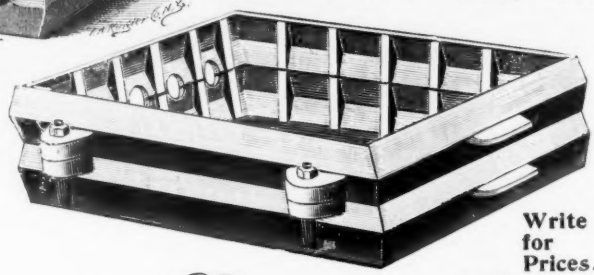

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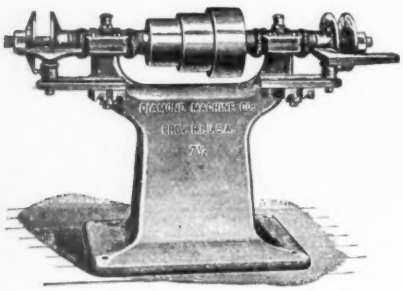

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This Grinder

was designed by us for foundry use. One stove maker has 16 of them. The distance between wheels is 48 inches, diameter of spindle between flanges 1¾ inches or 2 inches, as ordered. Babbitted boxes with three ring oilers. Weight, 1200 lbs. If you want a good substantial grinder write us for circulars and prices.

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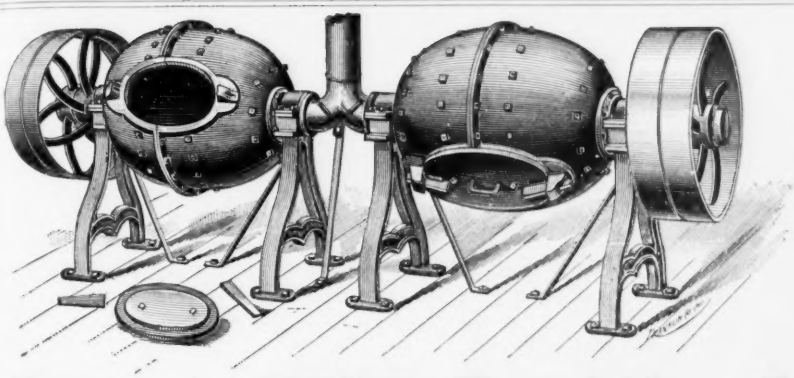

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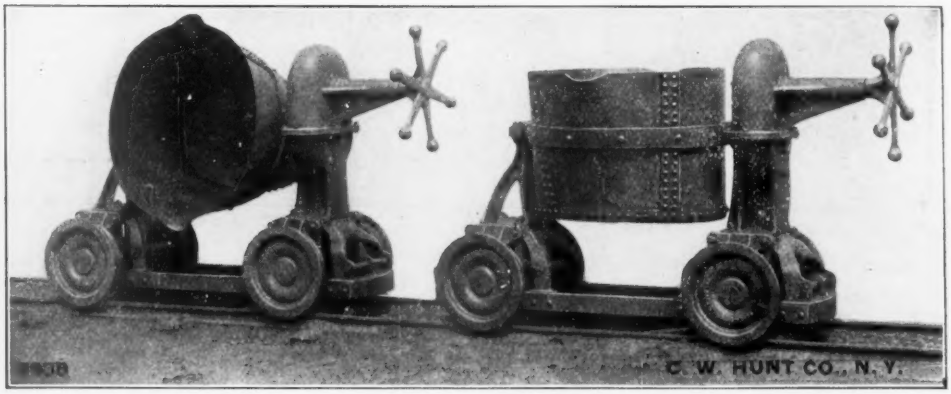

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Send for catalogue, samples and prices.

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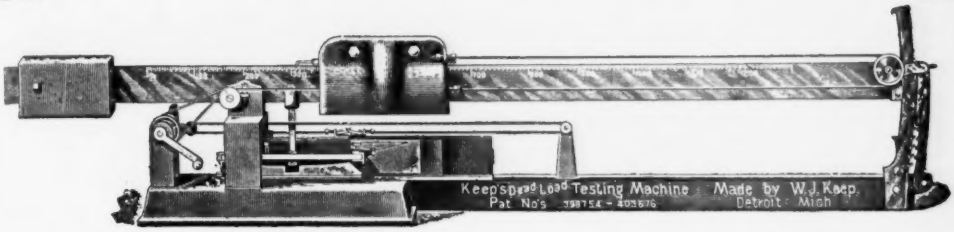

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Four of the Largest Consumers in the West, say:—

About No. 150. During the past three months Hussman averaged 13, 16⅝, and 17¾ heats, ———'s 7⅞, 10⅝ and 11.

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About No. 70. The Hussman Crucible gave us FIVE TIMES the number of heats obtainable from either ———'s or ———'s.

About No. 25. The Hussman gave 42 to 45 heats (4 heats per day) ———'s never gave over 30.

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Costs much less by the year.

"We found that a cast iron dryer shell which we could finish in six hours with your Carborundum wheels took thirty hours with the wheels we had been using."

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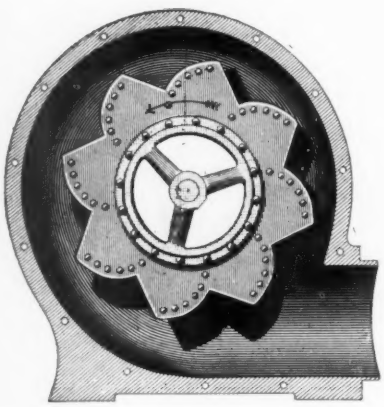
Carborundum not only does more work in less time —but it does better work than any other abrasive.
Ask us to prove it.

The Carborundum Company, Niagara Falls, N. Y.

The right amount of wind



for a cupola is obtained at the least cost with a ***Poole Blower.*** Being lasting, efficient, and installed at a nominal cost it is worthy of your investigation.

We are willing you should compare the performance of the ***Poole Blower*** with any other wind making machine.

Will you do that much?

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GIVES THE NAME AND LOCATION OF THE IRON FOUNDRIES IN THE UNITED STATES. :: :: ::

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A copy of this list in your office will introduce you to the many new concerns that have entered the foundry business. It will prevent you sending mail matter to people who are not interested in you wares.

The price of Penton's Foundry List is $10.00 post paid.

The Foundry Publishing Co.,

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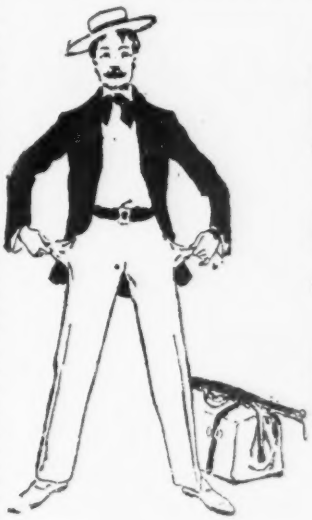

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trying to make Chaplets by old methods.

We can sell you Chaplets of all kinds at a less cost than you can possibly manufacture them.

Why shouldn't we? With special machinery and appliances we have certainly got the best of the situation.

What is more, we make a better Chaplet than you would make.

Do you want some samples to prove this?

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Stove Trimmings, Stove Scrapers, Stove Rods, Stove Bolts.

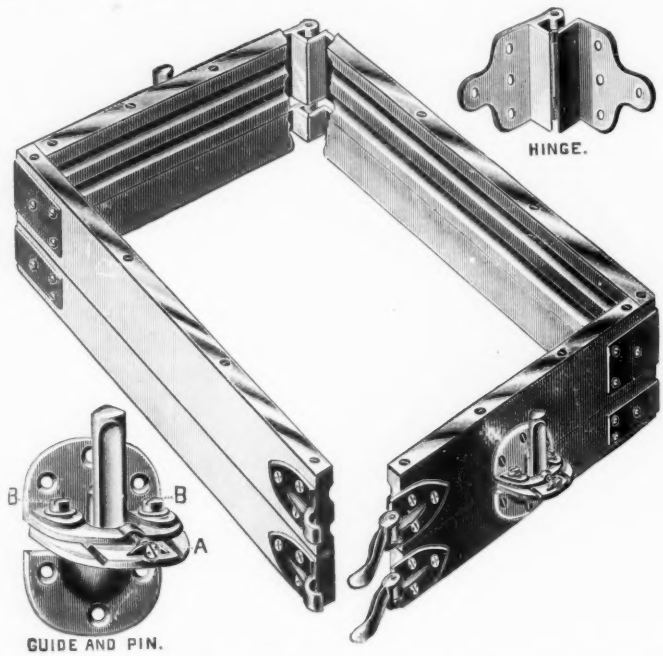
Quality first-class and prompt shipment guaranteed. Catalogue and prices furnished on application.

Stearns Improved Snap Flask

Cheaper than You Can Make Your Own.

The large "V" shaped pins with corresponding bearings insure a level lift of the cope, enabling comparatively inexperienced help to mold difficult patterns.

The inner edges of the malleable iron hinge are beveled, bringing the corners perfectly true. The flasks are made of whitewood—light in weight, yet stiff and strong, edges and corners bound with iron.



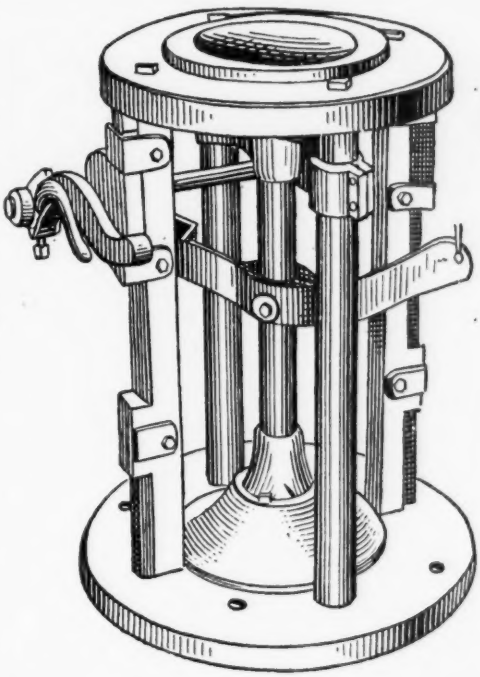
These sizes, which are inside measurement, with 2-inch nowel and 3-inch cope, are kept in stock:

No.	Sizes.	No.	Sizes.	No.	Sizes.	No.	Sizes.
1	9x13	8	10x13	15	11x13	22	12x13
2	9x14	9	10x14	16	11x14	23	12x14
3	9x15	10	10x15	17	11x15	24	12x15
4	9x16	11	10x16	18	11x16	25	12x16
5	9x17	12	10x17	19	11x17	26	12x17
6	9x18	13	10x18	20	11x18	27	12x18
7	9x19	14	10x19	21	11x19	28	12x19

PRICE, $2.50 Each. Special Sizes furnished at an advance of **25** cents, net, each. The metal furnishings, only, will be sold to parties desiring to make up their flasks. **Price, $1.50 per set.**

E. C. STEARNS & COMPANY, Syracuse, N. Y.

Makers of STEARNS BICYCLES and Manufacturers of Hardware.



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Our Cupola Blocks, Fire Brick, Molding Sand, Fire Sand, etc., are of the most substantial kind.

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but many foundrymen have yielded to the temptation to use "any old thing" during the past year, on account of the scarcity of pig iron.

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